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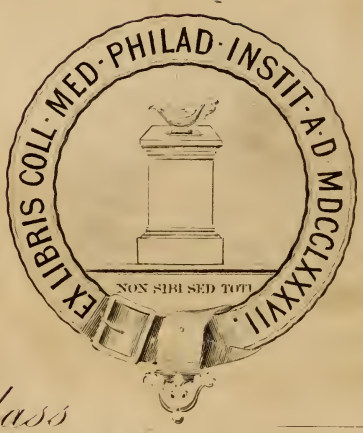

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TRANSACTIONS

OF THE

AMERICAN ORTHOPEDIC ASSOCIATION.

FIFTH SESSION,

HELD AT WASHINGTON, D. C.,

SEPTEMBER 22, 23, 24, AND 25, 1891.

VOLUME IV.

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LIST OF OFFICERS.

[Elected September 25, 1891.]

PRESIDENT.

BENJAMIN LEE, M.D.

VICE-PRESIDENTS.

REGINALD H. SAYRE, M.D.
HENRY LING TAYLOR, M.D.

CORRESPONDING SECRETARY.

ROYAL WHITMAN, M.D.

SECRETARY AND TREASURER.

JOHN RIDLON, M.D.,
337 W. 57th Street, New York.

COMMITTEE ON MEMBERSHIP.

E. H. BRADFORD, M.D. (*Ch'n*), DE FOREST WILLARD, M.D.,
ARTHUR J. GILLETTE, M.D., SAMUEL KETCH, M.D.,
L. A. WEIGEL, M.D.

EXECUTIVE COMMITTEE.

The President and the Secretary.

PUBLICATION COMMITTEE.

JOHN RIDLON, M.D. (*Chairman*).
BENJAMIN LEE, M.D.
JAMES K. YOUNG, M.D.

MEMBER OF EXECUTIVE COMMITTEE, CONGRESS OF AMERICAN PHYSICIANS AND SURGEONS.

NEWTON M. SHAFFER, M.D.
Alternate: AP MORGAN VANCE, MD.

LIST OF PRESIDENTS.

1887. V. P. GIBNEY, M.D.
1888. NEWTON M. SHAFFER, M.D.
1889. E. H. BRADFORD, M.D.
1890. DE FOREST WILLARD, M.D.
1891. A. B. JUDSON, M.D.
1892. BENJAMIN LEE, M.D.

MEMBERS.

* Original Members.
† Deceased.

1889. Bartow, Bernard, M.D. Clinical Professor of Orthopedic Surgery in the Medical Department of the University of Buffalo. 220 Franklin Street, Buffalo, N. Y.

*1887. Bradford, E. H., M.D. Visiting Surgeon to the Boston City, the Children's, and the Samaritan Hospitals; Instructor in Clinical Surgery in Harvard Medical School. *Vice-President*, 1888. *President*, 1889. 149 Newbury Street, Boston.

1889. Brackett, E. G., M.D. Assistant Surgeon to Out-patients, Children's Hospital; Physician to the Department for Nervous Diseases, Boston Dispensary; Assistant to the Department for Nervous Diseases, Boston City Hospital. 149 Newbury Street, Boston.

*†1887. Brown, Buckminster, M.D.

*1887. Brown, Dillon, M.D. 102 E. Fifty-seventh Street, New York.

*1887. Bryant, Joseph D., M.D. Professor of Anatomy and of Clinical Surgery, and Associate Professor of Orthopedic Surgery in Bellevue Hospital Medical College; Visiting Surgeon to Bellevue and St. Vincent Hospitals; Surgeon-General National Guard S. N. Y. 54 W. Thirty-sixth Street, New York.

1889. Burrell, Herbert L., M.D. Surgeon to the Carney and Children's Hospitals; Surgeon to Out-patients, Boston City Hospital; Demonstrator of Surgical Appliances, Harvard University. 22 Newbury Street, Boston.

1891. Cook, Ansel G., M.D. 55 Church Street, Hartford, Conn.

*†1887. Develin, Edward, M.D.

*1887. Foster, Charles C., M.D. Orthopedic Surgeon to the Cambridge Hospital. 5 Riedesel Avenue, Cambridge, Mass.

*1887. Gibney, V. P., M.D. Professor of Orthopedic Surgery in the New York Polyclinic; Surgeon-in-chief to the New York Hospital for Ruptured and Crippled; Orthopedic Surgeon to the Nursery and Child's Hospital, New York. *President*, 1887. *Vice-President*, 1889. Park Avenue and Thirty-fifth Street, New York.

1889. Gillette, Arthur J., M.D. Visiting Orthopedic Surgeon to University Dispensary; and Orthopedic Surgeon to St. Luke's Hospital, St. Paul. 301 Pleasant Avenue, St. Paul, Minnesota.

*1887. Goodman, H. E., M.D. Attending Surgeon to the Orthopedic Hospital. 1509 Walnut Street, Philadelphia.

*1887. Hodgen, Harry, M.D. 2604 Locust Street, St. Louis.

*1887. Judson, A. B., M.D. Orthopedic Surgeon to the Out-patient Department of the New York Hospital. *Vice-President*, 1890. *President*, 1891. 4 E. Twenty-fifth Street, New York.

*1887. Ketch, Samuel, M.D. Senior Assistant Surgeon to the New York Orthopedic Hospital; Surgeon to the Randall's Island Hospital; Clinical Professor of Orthopedic Surgery in the New York Woman's Medical College. *Corresponding Secretary*, 1887 to 1891. 328 W. Twenty-ninth Street, New York.

*1887. Lee, Benjamin, M.D. Secretary of the State Board of Health of Pennsylvania. *Vice-President*, 1889. *President*, 1892. 1532 Pine Street, Philadelphia.

*1887. Lovett, Robert W., M.D. Surgeon to the Samaritan Hospital; Assistant Out-patient Surgeon to the Children's Hospital; Out-patient Surgeon to the Carney Hospital. *Secretary*, 1889. 379 Boylston Street, Boston.

1889. McKenzie, B. E., M.D. Lecturer on Orthopedic Surgery in the Woman's Medical College; Consulting Orthopedic Surgeon to the Hospital for Sick Children, Toronto. 14 Bloor Street, West, Toronto, Canada.

*1887. Moore, James E., M.D. Professor of Orthopedic Surgery in the University of Minnesota; Orthopedic Surgeon to St. Mary's Hospital; Consulting Surgeon to the Northwestern Hospital for Women and Children. 125 Fourth Street, South, Minneapolis, Minn.

1889. Myers, T. Halsted, M.D. Orthopedic Surgeon to St. Luke's Hospital; Assistant Surgeon to the New York Orthopedic Dispensary; Surgeon to the Presbyterian Hospital Dispensary. 24 W. Fiftieth Street, New York.

*1887. Packard, George B., M.D. 1405 Stout Street, Denver.

*1887. Park, Roswell, M.D. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital and the Buffalo Eye and Ear Infirmary. 510 Delaware Avenue, Buffalo, N. Y.

1890. Phelps, A. M., M.D. Professor of Surgery in the University of Vermont; Professor of Orthopedic Surgery in the University

of the City of New York, Medical Department; Professor of Orthopedic Surgery in the Post Graduate Medical School and Hospital; Visiting Surgeon to the Charity Hospital, New York; Consulting Surgeon to the Mary Fletcher Hospital, Burlington, Vt. 40 W. Thirty-fourth Street, New York.

*1887. Ridlon, John, M.D. Assistant Surgeon at the Vanderbilt Clinic; Consulting Surgeon to the Church Hospital and Dispensary, New York. *Secretary*, 1891–'92. 337 W. Fifty-seventh Street, New York.

*1887. Roberts, A. Sydney, M.D. 1901 Walnut Street, Philadelphia.

*1887. Ryan, George W., M.D. Clinical Lecturer on Orthopedic Surgery in the Medical College of Ohio. *Secretary*, 1890. *Vice-President*, 1891. 114 W. Ninth Street, Cincinnati.

1889. Sayre, Lewis A., M.D. Professor of Orthopedic Surgery in the Bellevue Hospital Medical College; Consulting Surgeon to the Bellevue Hospital, the Charity Hospital, and the Home for Incurables. 285 Fifth Avenue, New York.

*†1887. Sayre, Lewis Hall, M.D.

*1887. Sayre, Reginald H., M.D. Assistant to the Chair of Surgery in Bellevue Hospital Medical College; Orthopedic Surgeon to the Out-door Department of Bellevue Hospital. *Vice-President*, 1892. 285 Fifth Avenue, New York.

*1887. Schapps, John C., M.D. Orthopedic Surgeon to St. Mary's Hospital Dispensary, Brooklyn. 486 Bedford Avenue, Brooklyn.

1889. Scudder, Charles Locke, A.B., Ph.B. (Yale), M.D. (Harv.). Assistant in Clinical Surgery in Harvard University; Surgeon to Out-patient Department of Massachusetts General Hospital. 94 Charles Street, Boston.

*1887. Shaffer, Newton M., M.D. Attending Surgeon-in-Charge of the New York Orthopedic Hospital and Dispensary; Consulting Orthopedic Surgeon to St. Luke's Hospital; Consulting Surgeon to the New York Infirmary for Women and Children. *President*, 1888. 28 E. Thirty-eighth Street, New York.

1889. Sherman, Harry M., M.D. Orthopedic Surgeon to the Children's Hospital, and to the Polyclinic, San Francisco. 705 Sutter Street, San Francisco.

*1887. Steele, A. J., M.D. Professor of Orthopedic Surgery and Disease of the Joints in the St. Louis Post-Graduate School of Medicine; Surgeon to the Augusta Children's Hospital, St. Louis. *Vice-President*, 1890. 2825 Washington Avenue, St. Louis.

*1887. Taylor, Henry Ling, M.D. *Vice-President*, 1892. 201 W. Fifty-fourth Street, New York.

1889. Townsend, W. R., M.D. Lecturer on Orthopedic Surgery in the New York Polyclinic; Assistant Surgeon to the Hospital for Ruptured and Crippled, New York; Orthopedic Surgeon to the New York Infant Asylum. Park Avenue and Thirty-fifth Street, New York.

*1887. Vance, Ap Morgan, M.D. Surgeon to the Louisville City Hospital, to Sts. Mary and Elizabeth Hospital, and to the Masonic Widows' and Orphans' Home and Infirmary. *Vice-President*, 1891. 229 W. Chestnut Street, Louisville, Ky.

1889. Weigel, L. A., M.D. Orthopedic Surgeon to the Outpatient Department of Rochester City Hospital. 54 N. Clinton Street, Rochester, N. Y.

*1887. Whitehead, W. R., M.D. 815 Fifteenth Street, Denver, Colorado.

1890. Whitman, Royal, M.D. Assistant Surgeon to Outpatients in the Hospital for Ruptured and Crippled, New York. 126 W. Fifty-ninth Street, New York.

*1887. Willard, DeForest, M.D. Clinical Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the White Cripples' Home, the Colored Cripples' Home, and the Home for Incurables, Philadelphia; Consulting Surgeon to the New Jersey State School for Feeble-minded Children. *President*, 1890. 1818 Chestnut Street, Philadelphia.

1891. Wilson, H. Augustus, M.D. Professor of General and Orthopedic Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Orthopedic Surgeon in the Polyclinic Hospital; Clinical Professor of Orthopedic Surgery in the Woman's Medical College of Pennsylvania; Clinical Lecturer on Orthopedic Surgery in the Jefferson Medical College of Philadelphia; Surgeon to St. Mark's Home for Aged and Infirm Women, Philadelphia. 1611 Spruce Street, Philadelphia.

1890. Young, James K., M.D. Instructor in Orthopedic Surgery in the University of Pennsylvania; Attending Surgeon to the Orthopedic Department of the University Hospital. 222 S. Sixteenth Street, Philadelphia.

HONORARY MEMBERS.

ELECTED

1891. EDMUND ANDREWS, M.D., 65 Randolph Street, Chicago, Illinois.

1889. HENRY G. DAVIS, M.D., 8 Parlin Street, Everett, Mass.

1889. W. J. LITTLE, M.D., F.R.C.P. Lond., M.R.C.S. Eng., 18 Park Street, Park Lane, W., London, England.

1890. WILLIAM MACEWEN, M.D., LL.D., Professor of Clinical Surgery, and Surgeon to the Glasgow Royal Infirmary; Surgeon to the Royal Hospital for Sick Children. 3 Woodside Crescent, Glasgow, Scotland.

1889. DAVID PRINCE, M.D.*

1891. C. FAYETTE TAYLOR, M.D., 201 W. Fifty-fourth Street, New York.

* Deceased.

CORRESPONDING MEMBERS.

ELECTED

1890. WILLIAM ADAMS, F.R.C.S., Senior Surgeon to the Great Northern Central Hospital, and to the National Hospital for the Paralytic and Epileptic; Consulting Surgeon to the National Orthopedic Hospital. 5 Henrietta Street, Cavendish Square, W., London, England.

1889. Dr. F. BEELY, 126 Potsdamerstrasse, Berlin, Germany.

1890. Dr. A. HOFFA, Privatdocent der Chirurgie an der Universität Würzburg, Würzburg, Germany.

1890. ROBERT JONES, F.R.C.S. Edin., Honorary Surgeon, Royal Southern Hospital; Consulting Surgeon, Manchester Ship Canal Works. 11 Nelson Street, Great George Square, Liverpool, England.

1890. Dr. E. KERMISSON, Professeur agrégé de la Faculté de Médecine; Chirurgien de l'Hôpital des Enfants Assisté. 27 Quai d'Orsay, Paris, France.

1890. Dr. SIEGFRED LEVY, Superintending Surgeon of the Society for the Relief of Crippled and Mutilated Children, Copenhagen. 135 Gothersgade, Copenhagen, Denmark.

1889. Prof. Dr. ADOLF LORENZ, Maximilian-platz 7, Vienna, Austria.

1889. HOWARD MARSH, F.R.C.S. Eng., Senior Assistant Surgeon and Lecturer on Surgery, St. Bartholomew's Hospital; Consulting Surgeon, Hospital for Sick Children, and Alexandria Hospital for Hip Disease. 30 Bruton Street, W., London, England.

1890. EDMUND OWEN, M.B., F.R.C.S., Surgeon to, and Joint Lecturer on Surgery at, St. Mary's Hospital; Senior Surgeon to the Hospital for Sick Children, Great Ormond Street. 64 Great Cumberland Place, W., London, England.

ELECTED

1890. Dr. PAUL REDARD, Lauréat de l'Institut; Ancien Chef de Clinique Chirurgicale de la Faculté de Médecine de Paris; Chirurgien du Dispensaire Furtado-Heine. 3 Rue de Turin, Paris, France.

1888. BERNARD ROTH, F.R.C.S. Eng., 29 Queen Anne Street, Cavendish Square, W., London, England.

1890. NOBLE SMITH, F.R.C.S. Edin., L.R.C.P. Lond., M.R.C.S. Eng., L.M.; Surgeon to All Saints' Children's Hospital; Orthopedic Surgeon to British Home for Incurables. 24 Queen Anne Street, Cavendish Square, W., London, England.

1890. HUGH OWEN THOMAS, M.R.C.S. Eng.*

1890. W. J. WALSHAM, F.R.C.S. Eng., M.B. and C.M. Aberdeen; Assistant Surgeon and Surgeon in Charge of Orthopedic Department, and Lecturer on Anatomy, St. Bartholomew's Hospital; Surgeon, Metropolitan Hospital; Consulting Surgeon to Hospital for Hip Diseases, Sevenoaks, and to the Burnley Cottage Hospital. 27 Weymouth Street, Portland Place, W., London, England.

1890. GEORGE ARTHUR WRIGHT, B.A., M.B. Oxon, F.R.C.S.; Senior Assistant Surgeon, Royal Infirmary, Manchester; Surgeon to Children's Hospital, Pendlebury and Manchester. 8a St. John Street, Manchester, England.

* Deceased.

MINUTES

OF THE

FIFTH ANNUAL MEETING

OF THE

AMERICAN ORTHOPEDIC ASSOCIATION.

Held at Washington, September 22, 23, 24, and 25, 1891.

First Day—*Morning Session.*

The Association met at the Arlington Hotel, and was called to order by the President, Dr. A. B. Judson, at 9 o'clock.

The President delivered an address on "Orthopedic Surgery as a Specialty."

Dr. W. R. Townsend read a paper on "Uniform Nomenclature in Orthopedic Surgery."

On motion of Dr. Ap Morgan Vance, the President appointed Drs. Vance, Townsend, and Lovett a committee to report a uniform nomenclature for the use of the Association.

Dr. Henry Ling Taylor read a paper on "Two Cases of a Peculiar Type of Primary Crural Asymmetry."

Dr. H. Augustus Wilson, of Philadelphia, read a paper on "A Case of Spina Bifida, with Partial Motor and Sensory Paralysis, Double Equino-varus, and Purulent Bursitis."

Dr. T. M. L. Chrystie, of New York, read a paper on "Congenital Club-foot with Absence of Great Toe and Contiguous Bones of the Instep."

Dr. William E. Wirt, of Cleveland, read a paper on "A Case of Club-foot, Club-hand, and Multiple Joint Deformity."

Dr. John C. Schapps read a paper on "The After-treatment of Excision of the Knee-joint."

Dr. A. J. Steele read a paper on "The Orthopedic Work of the late Mr. Thomas."

On motion of Dr. Townsend, the President appointed Drs. Townsend, Ridlon, and Steele a committee to draft suitable resolutions upon the death of Mr. Thomas.

Dr. A. M. Phelps read a paper on "Some Lateral Traction Fixation Hip-splints."

The Treasurer reported that all arrears and all dues were paid; that all debts of the Association were paid; and that there was now in the hands of the Treasurer one hundred and three dollars and seventy-six cents. The report was referred to the Auditing Committee (Drs. Lee and Ryan).

The resignation of Dr. Charles Fayette Taylor was read and accepted.

The resignation of Dr. T. G. Morton was read and accepted.

Letters were read by the Secretary from Corresponding Members, Drs. Siegfred Levy, of Copenhagen, and Mr. William Adams, of London. It was voted that the Committee on Publication be instructed to print in the *Transactions* such scientific portions of Mr. Adams's letter as appeared to them proper.

A number of amendments to the Constitution and By-laws were offered by Dr. Ridlon, and others by Dr. Judson. It was voted that a committee be appointed to consider these amendments and report at some future meeting. The President appointed Drs. Steele, Ridlon, and Bradford a Committee on Constitution and By-laws.

The Chairman of the Committee on Publication reported that there were at present on hand:

Ninety-three copies of Volume I.
Seventy-three copies of Volume II.
Seventy-four copies of Volume III.

Afternoon Session.

The meeting was called to order by the President at 2 o'clock.

The Secretary read a paper by Mr. B. E. Brodhurst, of London, on "Gonorrhœal Rheumatism: its Effects and Treatment."

Dr. E. G. Brackett read a paper on "Atrophy in Joint Disease."

Second Day—*Morning Session.*

The meeting was called to order by the President at 9.30 o'clock.

Dr. John Ridlon read a paper on "Syphilitic Spondylitis in Children."

Dr. T. Halsted Myers read a paper on "Pott's Disease and Pregnancy."

Dr. E. G. Brackett read a paper on "Paraplegia in Pott's Disease."

Dr. A. Hoffa read a paper on "Pressure Myelitis in Pott's Disease."

Dr. Roswell Park read a paper on "A Study of Atrophies."

Dr. W. R. Townsend read a paper on "The Treatment of Abscesses in Pott's Disease."

Dr. James K. Young read a paper on "Bilateral Lumbar Abscess; with a Case."

Dr. N. M. Shaffer, in place of a paper, made some remarks on "The Benign Course of Abscess in Pott's Disease under Efficient Mechanical Treatment."

Dr. Ap Morgan Vance read a paper on "The Aspirator in Orthopedic Practice."

Dr. Henry Ling Taylor read a paper on "The Value of Mechanical Treatment in Old and Neglected Cases of Pott's Disease."

Dr. A. M. Phelps read a paper on "Congenital Misplacement of the Hip, with New Apparatus for its Treatment."

Third Day—*Morning Session.*

The meeting was called to order by the President at 9.15 o'clock.

Dr. A. B. Judson read a paper on "Malignant Disease of the Vertebræ Simulating Pott's Disease."

Dr. Samuel Ketch read a paper on "Prognosis in Pott's Disease."

Dr. B. E. Hadra, of Galveston, read a paper on "Proposed Treatment of Pott's Disease by Wiring the Vertebral Processes."

Dr. DeForest Willard read a paper on "The Operative Treatment of Spinal Caries."

Dr. W. N. Bullard, of Boston, read a paper by Dr. C. L. Scudder and himself on "The Operative Treatment of Spastic Paralysis."

Dr. Bernard Bartow read a paper on "The Treatment of Pott's Disease with Especial Reference to the Early Stage."

Mr. Howard Marsh read a paper on "Pott's Disease in Middle and Advanced Life."

Dr. C. C. Foster read a paper on "Extension in Bed."

Dr. R. H. Sayre read a paper on "Traction and Fixation in Pott's Disease."

Dr. E. H. Bradford read a paper on "Comparative Value of the Present Modes of Treatment of Caries of the Spine."

FOURTH DAY—*Morning Session.*

The meeting was called to order by the President at 9.05 o'clock.

Dr. V. P. Gibney read a paper on "A Further Contribution to Typhoid Spine."

Dr. Benjamin Lee read a paper on "A Brief History of the Use of Suspension in Pott's Disease."

Dr. N. M. Shaffer read a paper on "Elongation of the Ligament Patellæ as a Factor in the Production of Certain Knee Troubles and Difficulties in Locomotion."

Dr. W. E. Wirt read a paper on "Apparatus for Making Traction."

Dr. Royal Whitman read a paper on "Observations on Torticollis, with Particular Reference to the Significance of So-called Hæmatoma of the Sterno-mastoid Muscle."

Dr. G. W. Ryan read a paper on "Rheumatic Spondylitis."

Dr. V. P. Gibney read a paper on "The Definition and Scope of Orthopedic Surgery."

Dr. F. Beely read a paper on "Pathological Anatomy of Lateral Curvature of the Spine."

The following papers were read by title:

Dr. W. R. Whitehead, on "The Best Means for Preventing a Loose Joint, or Dangling Limb, after Resection at the Shoulder-joint; with an Illustrative Case."

Mr. Robert Jones, on "The Use of the Wrench in the Treatment of Club-foot."

Dr. B. E. McKenzie, on "Operation upon the Concave Surface in Talipes Equino-varus."

Dr. R. W. Lovett, on "The Diagnostic and Prognostic Value of High Temperature in Chronic Joint Disease."

Mr. Robert Jones, on "The Tests for Recovery from Joint Disease."

Dr. Bernard Bartow, on "Rhachitis in Adolescence."

Dr. R. W. Lovett, on "The Diagnosis of Pott's Disease."

Dr. G. W. Ryan, on "The Differential Diagnosis of Pott's Disease."

Dr. H. L. Burrell, on "Abscess in Pott's Disease."

Mr. G. A. Wright, on "The Evacuation of Spinal Abscesses Without Drainage."

Dr. A. M. Phelps on "The Mechanical Treatment of Pott's Disease; with an Exhibition of Apparatus."

Dr. C. L. Scudder, on "Paralysis in Pott's Disease."

Dr. A. J. Steele, on "Pott's Disease in Adults."

Dr. Royal Whitman, on "The Prevention of Unnecessary Deformity in Pott's Disease."

Dr. Ap Morgan Vance, on "Recumbency in Pott's Disease."

Dr. B. E. McKenzie, on "Extension in Pott's Disease."

Dr. V. P. Gibney, on "The Treatment of Pott's Disease."

Dr. J. D. Bryant, on "Ten Cases of Excision of the Knee-joint for Disease, and their Lessons."

Dr. Paul Redard, on "The Relations of Lateral Curvature of the Spine and Flat-foot."

Dr. E. H. Bradford, on "Means of Recording Rotation in Lateral Curvature."

Dr. C. L. Scudder, "A Contribution to the Etiology of Lateral Spinal Curvature."

Dr. E. H. Bradford, on "Modifications in the Treatment of Lateral Curvature."

Dr. DeForest Willard, on "Spastic and Infantile Paralyses."

Dr. E. H. Bradford, on "The Treatment of Congenital Dislocation of the Hip."

The Auditing Committee reported that they had examined the accounts and vouchers of the Treasurer and had found them correct.

The Committee on Membership recommended the following names for election:

Dr. Edmund Andrews, of Chicago, for honorary membership; Dr. H. Augustus Wilson, of Philadelphia, and Dr. Ansel G. Cook, of Hartford, for active membership; and the Committee further recommended a suspension of the By-laws and the name of Dr. Charles Fayette Taylor for honorary membership. The recommendations were adopted and the candidates elected.

The Committee on Constitution and By-laws recommended: "That in future, nominations for membership be made either in a general meeting or sent to the Committee on Membership not later than four months before the coming annual meeting; that the Committee shall inform itself in regard to the qualifications of nominees and send to each member of the Association the names and vouchers of nominees two months before the meeting, and report to the general meeting the nominations; that as far as is practicable the nominees shall be expected to give evidence of active interest in the specialty in writings or in clinical work; that the Secretary of the Association act as Secretary of the Committee on Membership, *ex officio*, but without vote."

On motion of Dr. Shaffer, the report was accepted and the Committee continued, to report in writing to each member of the Association at the end of three months.

Dr. Bradford then resigned from the Committee.

On motion of Dr. Lee, the delegate to the Executive Committee of the Congress was instructed to vote for a change of time or place of the meeting of the Congress.

On motion of Dr. Ridlon, the Committee on Publication was instructed to publish the papers presented at this meeting in a volume of *Transactions*.

On motion of Dr. Willard, it was voted to elect new members next year at the first executive session.

The officers of the Association were then elected, as follows:

President.—Dr. Benjamin Lee, of Philadelphia.

Vice-Presidents.—Dr. R. H. Sayre and Dr. H. L. Taylor, of New York.

Secretary and Treasurer.—Dr. John Ridlon, of New York.

Dr. Samuel Ketch presented his resignation as Corresponding Secretary; and Dr. Royal Whitman was elected to fill that office.

Afternoon Session.

Dr. L. A. Weigel read a paper on "The Operative Treatment of Spastic Paralysis."

Dr. Benjamin Lee read a paper on "Additional Notes on Sacro-iliac Disease."

Dr. Ansel G. Cook exhibited Club-foot Shoes.

Dr. T. Halsted Myers exhibited a Reversible Varus Extension-shoe.

Dr. A. B. Judson exhibited Hip-splints and a Spinal Brace with Chin-rest.

Dr. Benjamin Lee exhibited a Teledactyl, an apparatus for picking up objects from the floor without stooping, and Apparatus for Sacro-iliac Disease.

Dr. W. E. Wirt exhibited an Extension Device.

Dr. F. Beely exhibited Corsets for Scoliosis and Spondylitis.

Dr. A. M. Phelps exhibited Apparatus for Congenital Dislocation of the Hip, and for Hip Disease.

Dr. DeForest Willard exhibited Cutting Forceps for Operations on the Spine.

The meeting adjourned.

The following Members were present:

Drs. A. B. Judson, Ap Morgan Vance, Geo. W. Ryan, John Ridlon, W. R. Townsend, Reginald H. Sayre, F. Beely, Louis A. Weigel, J. E. Moore, Benj. Lee, A. J. Steele, Newton M. Shaffer, John C. Schapps, Arthur J. Gillette, H. L. Taylor, A. Sydney Roberts, James K. Young, E. G. Bruckett, Samuel Ketch, T. Halsted Myers, Charles C. Foster, E. H. Bradford, Roswell Park, A. Hoffa, Howard Marsh, DeForest Willard, Bernard Bartow, V. P. Gibney, and Royal Whitman.

JOHN RIDLON, Secretary,
337 West Fifty-seventh Street,
New York City.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

NAME.

I. This Society shall be called the American Orthopedic Association.

OBJECTS.

II. The purpose of this Association shall be the advancement of Orthopedic science and art.

MEMBERS.

III. The members shall be graduates in Medicine in good professional standing, who are especially interested in Orthopedic science and art.

Candidates for membership shall have been engaged in the practice of medicine for at least three years, and shall have given evidence of satisfactory scientific attainments.

FORFEITURE OF MEMBERSHIP.

IV. The Association shall have power to declare forfeiture of membership in case of any member who ceases to exhibit an active interest in the science of Orthopedic Surgery. Any active member of the Association who shall absent himself from three consecutive annual meetings shall be dropped from the roll of membership, unless he shall be able to give satisfactory reasons to the Association for his dereliction.

BY-LAWS.

ELECTION OF MEMBERS.

I. There shall be a Committee on Membership, consisting of five. All nominations shall be made in open meeting by two members of the Association, and shall be referred to the Committee on Membership, who may report on each name as they shall think proper; such report to be made at the next annual meeting following that at which the nomination is made. But the proposers of any member may, after the report of this Committee has been received, bring such name before the Association.

The Secretary shall soon after each annual meeting send to each member of the Association a list of the names of all candidates proposed for membership, together with the names of the proposers and of the members of the Committee on Membership.

A vote of three-fourths of the members present at an annual meeting shall be requisite to an election.

The election shall be by ballot.

Every member shall sign the Constitution and By-laws.

Honorary members may be chosen by the Association in the same manner as active members. Corresponding members, eligible to active membership but residing out of the United States, may be chosen in the same manner as active members. Honorary and corresponding members shall not be expected to pay fees or dues. They shall enjoy all the privileges of active members, except voting and election to office and appointment on Business Committees. They shall, if practicable, sign the Constitution and By-laws.

OFFICERS.

II. The officers shall be a President, two Vice-Presidents, and a Recording Secretary, who shall also be Treasurer. Their terms of office shall be for one year. There shall be a Corresponding Secretary, whose term of office shall continue from year to year, unless limited by the Association.

The President shall conduct the meetings of the Association.

The Recording Secretary shall keep the minutes, carry out the

instructions of the Association in respect to its *Transactions*, and call its meetings. He shall also take charge of moneys for the Association.

The Corresponding Secretary shall conduct all foreign correspondence.

The President and Recording Secretary shall be elected at the close of each annual meeting, to manage the affairs of the Association during the interim, and to serve at the ensuing meeting.

MEETINGS.

III. The Association shall hold its meetings annually on the third Tuesday of September, at such place as may be determined; the time and place of meeting to be advertised by the Secretary, and notice to be sent to members. Eight members shall constitute a quorum.

PROCEEDINGS.

IV. The proceedings of the Association shall be issued in pamphlet form.

There shall be a Publication Committee of two to act in connection with the Recording Secretary in publishing the *Transactions*.

FEES.

V. The initiation fee shall be twenty-five dollars; the annual dues fifteen dollars.

EXPULSION OF MEMBERS.

VI. Any member may be expelled for cause by a three-fourths vote of those present at any annual meeting.

No action in matters of discipline shall be taken at any session of an annual meeting at which there shall be present less than three-fourths of the members registered as attending such annual meeting. A vote of three-fourths of the members thus present shall be necessary for expulsion.

ORDER OF BUSINESS.

VII. The following shall be the order of business at the annual meetings of the Association:

1. Reading records of previous meeting.
2. Appointment of Committees.
3. Report of Treasurer.
4. Report of Committees.
5. Election of new members.
6. Written communications.
7. Stated discussions.
8. Verbal communications.
9. Incidental business.

ALTERATIONS OF BY-LAWS.

VIII. A vote of three-fourths of the members present at any annual meeting shall be requisite for an alteration of the Constitution.

A vote of a majority of the members present at an annual meeting shall be requisite for an alteration of the By-laws.

Propositions to amend or alter the Constitution or By-laws must be made at one session of the annual meeting, and acted upon at a subsequent session of the same annual meeting.

STANDING RULES.

I. Whenever a candidate is proposed for membership, both the proposer and seconder shall furnish letters setting forth the claims of such candidate for membership.

II. Names of members in arrears to the Association for three years shall be stricken from the list three months after the notification of this rule has been served upon such members, except in the case of those absent from the country.

III. The Secretary shall, about April 1, send a request to each member to forward the titles of such papers, specimens, or apparatus as he desires to present at the next meeting of the Association. Such titles shall be incorporated by the Secretary in the printed call for the meeting, and these papers shall have precedence over all others.

IV. Twenty minutes shall be the maximum time allotted to the reading of any paper, unless by special vote of the Association in each case and by a two-thirds majority. Any paper requiring more than twenty minutes for its reading shall be presented in abstract under the same limitation to twenty minutes.

V. The Publication Committee may receive for publication in the *Transactions* any paper the title of which appears upon the programme of a stated meeting.

VI. All essays and contributions, the titles of which have been sent and accepted by the Association for use at its meetings, shall be the property of the Association, and shall not be published or used for other purposes without the consent of the Executive Committee.

VII. All papers and other communications intended for publication shall be placed in the hands of the Secretary before November 1st; proofs of the same shall be sent to the several writers, returnable within two weeks. In case of non-compliance with this rule, any paper may be omitted from the published *Transactions* at the discretion of the Publishing Committee.

VIII. The President and Recording Secretary shall not have power to incur any debts for the Association exceeding in total the sum of one hundred dollars, unless especially authorized to do so by the recorded vote of the Association.

IX. All proceedings of the Association, not specified, shall be in accordance with the Manual of the House of Representatives.

X. No member is to be considered as having attended an annual meeting unless he has registered.

THE PRESIDENT'S ADDRESS.

ORTHOPEDIC SURGERY AS A SPECIALTY.

By A. B. JUDSON, M.D.,
NEW YORK.

A FLOURISHING medical society sometimes divides into sections. It is an involuntary process, or at least one to which the members are forced by the necessity of thoroughly accomplishing the objects of the society. The process may be called an analysis. In the present instance, however, if I understand the organization of the Congress of American Physicians and Surgeons, we have a synthesis. A number of societies voluntarily combine to secure ends which were not contemplated at the beginning of each. A division of labor having been made, according to which each society has its special work to do, it is proper and useful for the societies to meet together for coöperation. Let us therefore briefly consider some of the salient features which mark our specialty of orthopedic surgery. A better knowledge of ourselves will put us in more quick relation with other workers, both general and special, and enable us better to do our humble part in the grand plan.

In common with other specialists, we occasionally hear that we are limited in the possible range of our achievements. The limitation is, however, entirely voluntary, and the work within these limits is practically inexhaustible. If we were not so busy, we might perchance be troubled because we are not always and exactly understood. The sign before an orthopedic hospital in New York is supposed by some of the passers-by to indicate a homœopathic institution. I am probably not alone in having been asked to perform the minor surgical operations of the chiropodist. Many, even among the learned, suppose that the latter part of our name is

derived from the Latin word for *foot*, instead of from the Greek for *child*. We are also confounded in the minds of some with the instrument-makers. I mention these things in passing, without a serious thought. If they exist, like morning mist they will pass away.

It is well, however, to recognize the fact that our practice is comparatively lacking in popular qualities. We have no critical, capital, or brilliant operations. What of brilliancy is there in keeping a limb in such an attitude that the weight of the body in locomotion shall be a favorable, instead of an unfavorable agent, until the natural growth of the member results in comparative symmetry; or, in controlling the environment of the diseased joint and the patient, so that the natural processes of recovery and repair shall have their triumph, while the limb is daily growing in symmetry and ability with the growing child? This is not bold surgery, but there is great pleasure in watching and reverently assisting these constantly recurring natural miracles. And will any of us forget the delightful friendships made among our little patients, their pretty bashfulness, their ready confidence, their irrepressible cheerfulness, their graceful acceptance of what is, alas, inevitable? The combination in them of childish and heroic qualities is a daily wonder. To watch them at play is like a dream in which the birds and wild flowers are enacting a tragedy and improving the precepts of Stoic philosophy.

Our practice is not only lacking in brilliant achievements, but it is also uninviting, because, as a rule, our patients do not make absolute recoveries. There is always, or nearly always, a residuum of disability and deformity, and in this is to be found perhaps one reason why our specialty has existence; for, what general practitioner would lightly assume the care of a case so exceptional in his practice, and so momentous as those which fall into our specialty?

The why and the wherefore of specialties in general, and ours in particular, are questions of interest. Some will say that we have a natural aptitude for mechanics, an inherited preference for slow and sure methods compared with those that are quick and uncertain, or an inborn reverence for what is physically demonstrable. These personal characteristics may explain why some of us are orthopedists, but I believe the reason why our specialty exists and thrives, is to

be found in the desire of the public, the final arbiter, that experts should be invited to bear the responsibility of orthopedic cases.

One very attractive feature of orthopedic practice, is its *reality* —for want of a better word. It is especially the domain of physical demonstration, where the acceptance of pathological doctrine, as well as therapeutic precept, must be preceded by absolute proof. Here, subjective symptoms are forgotten in the presence of objective signs. The data for diagnosis are visible, palpable, and mensurable. Treatment is by forces whose action is nicely directed, increased, diminished, and accurately measured. The very weight of the body is duly considered in trauma and therapeutics, and finally the results of treatment are recorded in degrees of a circle and fractions of an inch. Dealing thus, as we do, with physical realities, it is well for us to keep our eyes open to the moral verities also, which no less form part of the tissue of our daily professional work. Let us remember that diligence is the price of success, and that the only desirable success is that which is reached by the rejection of error and the loyal recognition of truth.

Since our last meeting, there has occured the death of one of our corresponding members, whose hostility to error might in all friendly criticism be called intemperate; one whose diligence and devotion to the interests of his patients make him an exemplar worthy of our affectionate remembrance. But I will not trespass on the subject of the first paper of our session, which is by Dr. A. J. Steele, of St. Louis, on the orthopedic work of the late Mr. Thomas, of Liverpool.

THE ORTHOPEDIC WORK OF THE LATE MR. THOMAS.

By A. J. STEELE, M.D.,
ST. LOUIS.

Mr. Thomas was a corresponding member of our Association, and at the time of our last meeting, even at the time of the issuance of our last *Transactions*, was well and actively engaged in the discharge of his onerous professional duties. In January last he died of a pneumonia, induced by becoming overheated while hastening to catch a homeward-bound train, from a visit to a patient in the suburbs of Liverpool. He was fifty-seven years of age, thus still in the vigor of later manhood, and, according to the average, there should have been spared to him many more years; had it been so ordered, they would have been full of usefulness and ripe experience. For us, his removal has come all too soon, as his chief work was in our department. He had already accomplished much, given us new principles and many appliances, but doubtless his large experience, fertile brain, and expert handicraft would have added valuable suggestion could a decade more have been given to a life already teeming with good deeds done and kind words spoken to many a needy sufferer.

It is within our own time that his work has been accomplished and the results given to the world, and in orthopedic surgery more of originality and practical therapeutic suggestion has been given by no one.

Mechanical therapeutics was his forte. Individually I am enough of a tinker to appreciate a surgeon like Mr. Thomas, who understood the principles of mechanics, and was so adroit in the use of machinist's tools that he could fashion a metal splint to the requirements of a fractured bone, a deformed limb, a crooked back, or a

diseased joint. He had, what every orthopedic surgeon should possess, a manual dexterity with tools. I well remember the evident pleasure he took, now some eight years since, in leading me to an upper room where were forge, and lathe, and anvil, and machinist's tools, where with his own hands he had fashioned and welded and riveted for many an hour, for many a year—at first experimentally, later in perfecting.

As orthopedic problems have confronted me, I have often wished that I might have enjoyed the advantages that my boy, for example, will have in the practical instruction to be received at the manual training school, where youths are drilled in the use of tools and machinery, and the mind disciplined with the theory of mechanics. You will pardon a little local pride when I suggest that we in St. Louis were the pioneers in this department of practical study;[1] and so appreciated is the work that enlarged buildings are still too limited.

Without doubt, Mr. Thomas's attention was early directed to joint affections from witnessing the manipulations of his father, a "qualified" bone-setter, enjoying both reputation and practice. And may we not believe that the son's sensitive, sympathetic nature heard the cry of the tortured, abused articulations, and from an educated, scientific standpoint determined to redeem them from the malpractice of the times. 'Tis said that, "Like son like father," but it was not so here. Doubtless observing the evil results of his father's empirical manipulations he resolved to avoid the same. This experience in his father's surgery gave him such knowledge of the injurious effects of "bone-setting," *i. e.*, pulling and working the articulations, especially when inflamed, that he was prepared to severely anathematize the practice, and to directly criticise Wharton Hood and Mr. Paget, and our honored guest, Mr. Marsh, for even suggesting that there might be cases that would be benefited by manipulation and forcible movement. He also condemned passive motion undertaken either for preventing ankylosis or for breaking up adhesions. His observation taught him that the patient's own unaided efforts would in time restore all possible motion to the joints—if not, then the articulation was still unhealthy.

[1] The Boston School of Technology has a different scope.

Motion was his nightmare, so the principle of "surgical rest to diseased joints" was strongly enunciated by him. By it he meant thorough immobilization or fixing of the joint, removal of concussion —such as the lower limbs experience in walking—and avoidance of circular compression. Such compression, he indicates, would curtail the blood supply and interfere with the physiological well being of the articulation. He did not claim this idea of rest to be either original or new, giving Hilton and Brodie due credit for enunciating it, but he believed there was occasion for strongly reiterating it, as American surgeons were, twenty years ago, claiming that motion, *per se*, was not only harmless, but even beneficial—that traction of the limb meanwhile relieved contact and prevented friction.

In a strongly controversial spirit he attacked this "heresy," as he termed it, and by argument and illustrative cases made for himself a strong and unassailable position—founded on the idea that joint disease is inflammatory in character, and that rest above all else is requisite for its reduction.

Dryden makes one of his characters say:

> "'Tis evidence so full,
> If the last trumpet sounded in my ear,
> Undaunted I should meet the Saints half way,
> And in the face of Heav'n maintain the fact."

So would Mr. Thomas assert in regard to his peculiar views, convinced of their truth as he was both by reason and practice.

Those of us who have been with him in person or who have carefully perused his works entertain no doubt as to the sincerity of his convictions.

Individually, I believe he was right in this doctrine of rest, and that the profession is under great obligations to him for his emphatic proclamation of their principles and for the ingenious devices by which he would seek to apply it to individual joints.

All joints do not assume the same position as regards flexion or extension when affected. Mr. Thomas combated the idea that this position, whichever it might be, was due to intra-articular pressure, nor did he adopt the specious theory of "position of greatest ease," but asserted that it was a simple question of antagonism of muscles, the stronger overcoming the weaker—usually inducing a position of flexion. Thus his appliance was such as to assist the weaker muscles,

and as rapidly as possible force the limb into such position that happily it would find itself when recovered ready for greatest use should motion be restored on the one hand, or ankylosis occur on the other. In reducing the limb to improved position, and in so retaining it, the principle of leverage was invoked, the danger of intra-articular pressure being wholly ignored. I believe the majority of us would, as a rule, employ traction with a minimum of leverage for straightening a limb to gain improved position, being apprehensive of intra-articular pressure, and with the intention too of combating the contracted muscles.

Mr. Thomas was opposed to traction, and violently assailed those who employed it in the reduction of deformity, or in the treatment of diseased joints, terming them "tractionists," and claiming that no advantage was gained but that injury was done and time lost. I believe he was wrong, and I exceedingly regret the bitter spirit in which he assailed the many able surgeons who employ it both in the treatment of joints and fractures.

The hip-diseased child places the sound foot on the opposite one and pushes down, thus extending the limb and obtaining relief; and if the surgeon supplements this action by grasping the ankle and making firm traction, what comfort is afforded! How rapidly the application of weight and pulley relieves the pain of coxalgia! While mechanical aids are invoked to fix a joint, the valuable adjunct of traction should not be ignored. It may not be practicable or necessary to employ it to all joints alike, but when it can be used comfort and more rapid resolution will be secured. Its employment is especially indicated in the early and active stages of articular affections; later, as the inflammatory action subsides, reflex contractions of the muscles diminish, so a mild traction answers.

While condemning traction, yet Mr. Thomas was very tenacious as to whom belonged the credit of having first introduced it into practice, and asserted that Americans should not claim priority in its use, as Mr. James, of Exeter, had advocated its employment and explained his method as early as 1839. Now this may be true, but we may justly claim the use of adhesive plaster as a practical means of making attachment to and of getting a hold on the limb to be drawn upon—a convenience that the gaiter or laced legging can never equal. A slight inconsistency is observed between Mr.

Thomas's teaching and practice, for while objecting to traction yet he advised it in connection with his knee-splint: the joint being flexed, attachment was made to the leg by a laced gaiter. Thus the best of men blow hot and cold.

As I speak of traction your thoughts revert to the hip, for here it finds its greatest need, and where most of us at home and many abroad apply it. Not so, however, with Mr. Thomas; he devised a splint to simply prevent the joint from bending, a splint which gave him his earliest and most marked notoriety in the profession. It is an original, simple, and ingenious device, and while not perfect is probably the best portative splint in use. Certainly it has given, in the hands of its designer, judging from his reports, excellent results. But we wish that he had additionally recorded his fatalities, the proportion of shortened and flexed limbs, his discharging sinuses, his tubercular meningites, his amyloid degenerations. Some of you have criticised this splint, claiming that it did not thoroughly fix the articulation, that it allowed the limb to rotate, that it was awkward in sitting and in defecation, and that the patient could, if so inclined, get the foot to the ground. All true, but possibly you have labored, as did I, under the impression that this was strictly a portative appliance, that, hip-disease being found, then the splint, patten, and crutches at once. But not so; Mr. Thomas immediately applied the splint, but put the patient to bed; and for months and months his patients were treated by recumbency—wearing the splint but lying on their backs until the disease was arrested and convalescence assured, then the high sole and crutches in conjunction with the splint. I am in accord with the recumbency practice during the early and middle stages of the disease, but I am positive the patient can be made more comfortable and the limb just as thoroughly immobilized, possibly more so, by means of the stretcher-splint—covered iron frame—than by the posterior iron bar, besides permitting traction; furthermore, in the movements necessary for defecation, or for transportation from bed to table or carriage, no disturbance of the patient, no jar or motion is had. Later, when the patient is sufficiently convalesced, then the Thomas splint finds judicious application.

To know when a joint is sufficiently recovered to allow motion and use—that is to say, when cured—were an important question,

which Mr. Thomas solves with the suggestion that disappearance of the symptoms of the disease indicates that treatment may be discontinued; and recovery is assured when, after use, the patient can extend the limb to the position acquired while in the splint, *i. e.*, ability to place the limb in the position it was maintained at during treatment. This is a valuable suggestion, for many a joint has been sacrificed after judicious treatment by unwittingly being allowed use too soon.

The Thomas knee-splint, consisting of padded groin ring and side rods extending to heel of boot, admirably meets the indications of removing concussion and securing fixation, without encircling compression of the joint. My patients, especially adults, have complained so of the pressure of the perineal ring that I have substituted for this splint one made of heavy leather, shaped over a cast of limb, covering the posterior three-fourths of limb from natal fold to lower calf, light leather flaps covering the anterior part of thigh and leg; laced, leaving the knee free. To keep the heavy leather from pressing the joint laterally, the limb is padded in making the mould. This splint fits accurately, is worn comfortably, and with thickened sole on opposite foot, and crutches, meets all the indications.

As before remarked, Mr. Thomas never compresses a diseased joint, unless in serous collections of acute synovitis, and then rarely. In his bent-iron rod, by which he simply and efficiently fixes the ankle-joint, in slinging the arm for elbow- or shoulder-joint trouble, in extending the wrist on an anterior splint, in all cases the joint itself is left free, that there may be no interference with the circulation. I am becoming somewhat converted to this practice of no joint pressure, though I had supposed circular compression to be an efficient agent in hastening resolution in certain articular conditions, and had believed in the rubber bandage and Martin's claims. The same in fractures: Mr. Thomas prefers to treat them by what he terms the indirect method, that is, no local compression. What would he have said about my preceptor's plan, that of Dr. E. M. Moore, of applying, after reduction, a two-inch strip of adhesive plaster around the site of a Colles fracture, which to-day is the method above all others?

Speaking above of joint collections, Mr. Thomas, in his early days, tapped for either serum or pus, and invented an ingenious reversible-current aspirator; this in later years he rarely employed,

having observed that Nature was equal to the emergency if let alone, that is, if the joint was given "surgical rest." Possibly wise practice as regards serous, but not in pus collections. And this brings us to his treatment of abscesses, which of late consisted in letting them take their course—in this particular, at least, agreeing with some of our New York members. As a surgeon, it would seem that Mr. Thomas was not fond of the knife; tenotomizing rarely, osteotomizing never, arthro- or arthrectomizing never, and amputating about as seldom, and now interfering with abscesses rarely. We must, however, believe that had he early become familiar with the asepsis and antisepsis of these times he would have done, as we do—open abscesses early, wash out thoroughly with bichloride or boracic acid, and dress antiseptically. I am not familiar with his medicated sawdust dressing for discharging sinuses and suppurating wounds, but cannot believe it preferable to fluffy bichloride gauze, which is light, cleanly, absorbent. He properly condemns poultices as vile filth, and yet strangely enthuses over oil and open-wound treatment.

In strong language, and by consistent practice, he teaches that surgical fixation of a joint never produces ankylosis. On the contrary, if the joint is inflamed, the more prompt and thorough and protracted its immobilization, the less likelihood is there of ankylosis occurring. Passive motions to prevent stiffness, he condemns as injurious, especially if joint irritation exists. When the disease is arrested then the active voluntary movements of the patient will accomplish all that is possible toward restoration. These ideas, so different from the classic traditions of the past, are to be commended, and will in practice be found correct. The French have given us the same; to whom belongs priority I cannot say.

Of constitutional treatment in joint disease he says but little; advises inhibitive drugs, without, however, particularizing. Would that he had mentioned a few. He intimates, strangely, that change of air is unnecessary.

One is struck with his poverty of pathology. I do not recall a single reference to the valuable scientific work of the Germans in this field. There is only the one thought—that of combating inflammation; nothing of attacking the tubercle bacillus, either to destroy or remove. Possibly had he entered the surgical arena fifteen

years later than he did, he would have been boring into the bone or injecting the joint.

His views as to the causes and treatment of deformities we can but briefly notice: Lateral curvature, he indicates, is due to unequal length of the two limbs, and thus the remedy is a high sole to render the transverse axis of the pelvis horizontal. How that simplifies this *bête noir* of orthopedics! And yet to-day we have cases of scoliosis where the limbs are of equal length, and we are cognizant of cases where from infancy disparity in the two limbs has existed, and yet no lateral curvature.

In Pott's disease he finds efficient support afforded by the posterior wire cuirass or shield, and he roundly condemns the gypsum jacket, his objections to which would also apply to the antero-posterior supports and the felt and leather corsets. Personally I am committed to the leather, and with gratifying results. In the cervical region he employs a metallic collar covered with felt. From experience I know it affords support, but advise, when practicable, recumbency with occipito-mental traction.

He corrects flat- and splay-foot by wearing a boot with heel elevated on inner side. A valuable suggestion, but should not be used to the exclusion of other means. In valgus, tenotomy and the application of a padded concave sheet-iron splint to the external aspect of leg and foot, followed by the sloping-heeled boot, is well advised. His treatment of talipes calcaneus is novel; to a high heel is attached a posterior leg-check iron to prevent flexion of the foot—a rude affair by the way—the tendo Achillis is percussed with a piece of wood and the calf muscles flagellated with a piece of leather, after which a garter of adhesive plaster is applied below the knee "to dam the circulation and thus improve the nutrition of the leg." This operation is repeated at regular intervals and gives, he asserts, excellent results. He has no faith in shortening the tendon by removal of a small section. In equinus and equino-varus he divides the tendo Achillis, but not the plantar tissues, preferring to stretch and tear them with manual power alone or aided by a powerful wrench by which an all-sufficient leverage is obtained to carry the foot in any desired direction. After correction an ingenious shoe is applied, consisting of a flat vertical bar and properly shaped piece of sheet iron, to which the foot is bandaged in improved position. For a

walking shoe an inside leg-bar is bent and carried into a hole or socket in the boot heel, the ankle being strapped to the bar.

For the correction of bow-leg a fracture is attempted; unsuccessful in this, then repeated daily strainings done by a strong bent-iron lever bandaged to the inner side of the leg.

In knock-knee, mechanical means only are employed for correction, consisting of a vertical strong metal stem with lower end bent at right angle to go into a socket in heel of boot. To the upper end padded sheet iron makes pressure on the trochanter, and another piece, a few inches up from the lower end, presses on the fibula just where that bone ceases to be subcutaneous. The limb being bandaged to this, its action is to correct the deformity on the lever principle—to be effective, however, the knee is kept extended by a posterior bar. It is a portative splint and effects permanent cure by causing absorption of the inner condyle and encouraging growth of the outer.

Mr. Thomas has left us a number of published volumes; no one of them, however, is a masterly treatise. They are chiefly therapeutic suggestions. His style is not easy, and repetitions are frequent. At times markedly controversial, complaint has justly been made of the intemperate tone which defaces too many of his pages. Americans, especially, in their orthopedic work are severely berated. Scientific criticism is proper, but personalities with sarcastic epithets are *mal à propos* and belittle the writer. Peculiarly independent in his opinion of others, he seems willing to be criticised in return, for he allows the following to appear among the book notices of one of his works: "The paper is good, the type is better, and the binding is best of all. . . . . Truly of the making of books there is no end, and this work appears to us to be a notable example of unnecessary manufacture."

I have greatly enjoyed perusing his works, and it has not been without profit, and I trust what he has left us in print will be found in the library of each member of our Society, for from no single source within our own times has so much of orthopedic originality and suggestive practice emanated.

UNIFORM NOMENCLATURE IN ORTHOPEDIC SURGERY.

By W. R. TOWNSEND, M.D.,
NEW YORK.

The continued success of the American Orthopedic Association, and the recognition of orthopedic surgery by the last International Medical Congress, have placed our specialty upon a firm basis—and as America has so far taken the lead, not only in the work done by the pioneers in orthopedic surgery, but in establishing the right of orthopedic surgery to exist as a distinct branch of surgery, so it seems to me this Association should take the lead in defining what is orthopedic surgery and in establishing a uniform nomenclature. This last problem is not as easy of solution, perhaps, as the former, but, it seems to me, should be considered. It is to be clearly understood that no desire exists to establish a new school of pathology or to coin new words, and thus add to our already long list. Nor is it intended to champion any particular pathology, or assist in establishing a traumatic, specific, or tubercular origin for any of the various lesions of joints. As accuracy in diagnosis is the aim of every scientific surgeon, so should we endeavor to promote this accuracy by properly classifying our cases, and this can never be done by calling cases of synovitis, arthritis, or osteitis simply knee-joint disease. Nor is there any good reason why identically the same disease should be spoken of in the Hospital Reports of the Roosevelt, St. Luke's, Mt. Sinai, New York Orthopedic, and the Hospital for Ruptured and Crippled, New York, and the Children's Hospital, Boston, under seven different headings. They speak of hip disease, hip-joint disease, tuberculosis of the hip, tuberculosis of the hip-joint, morbus coxæ, chronic disease of the hip-joint and osteitis of the femur. In other hospital reports, although we know they have cases

identical with the above, yet we are not sure of the fact, as they are classed under heads of caries, necrosis, arthritis, synovitis, etc. The pathology of these various conditions is sufficiently well understood and the symptoms in most cases are sufficiently clear to warrant us in making accurate diagnoses, and if we are agreed upon the pathology and symptomatology, why should we not agree upon a nomenclature?

If the synonyms in use produce more or less confusion, why not establish some terms upon which we will all agree, rather than increase the confusion by making new words, as is being constantly done.

A recent writer in the New York *Medical Journal* says "that it is an oft-repeated complaint that not enough recording is done by Americans for Americans; that we are obliged continually to draw upon the accumulated statistical wealth of the painstaking German for our facts." We all realize the truth of the statement, and those of us who occasionally endeavor to consult hospital records know how unsatisfactory they are, and how much of this is due to a lack of uniformity in nomenclature and in the taking of histories, and it is to be hoped that after a uniform nomenclature is established, a uniform system of measurements and of recording histories in orthopedic cases will soon follow.

TWO CASES OF A PECULIAR TYPE OF PRIMARY CRURAL ASYMMETRY.

By HENRY LING TAYLOR, M.D.,
NEW YORK.

It has been well known for some eighteen or twenty years that the lower extremities of some individuals, otherwise normal, differ in length, and that occasional cases occur where this difference is considerable. The question has been studied with reference to shortening after fracture of the femur, and also as to its bearing on the etiology and treatment of lateral curvature of the spine. In a previous paper[1] a simple method of examination was described by the writer, and 34 cases were recorded where the difference in the length of the extremities had been found to be more than a quarter of an inch; in 6 it was an inch or more. The left leg was shorter in 30 cases; the right, in 4. About half the cases had permanent curvature—that is, a curvature which did not disappear when the pelvis was levelled. Considerable stress was laid on the importance of pelvic obliquity as an etiological factor in many cases of curvature.

In calling attention to these results Dr. F. Beely, of Berlin,[2] remarked that there was an apparent difference in the height of the iliac crests in many early cases of true lateral curvature due to rotation of the pelvis and shoulders or head, before much spinal deformity was apparent, and that in such cases as he had examined there was no actual difference in the length of the extremities.

It is certainly true that where there is much rotation of the lumbar spine it is often difficult to be sure one is levelling from correspoding points on the iliac crests; then, if in the standing position

[1] "Primary Crural Asymmetry," The Medical Record, April 26, 1884.
[2] Centralblatt für orthopädische Chirurgie, July, 1885.

the pelvis is rotated on a vertical axis passing through or near one acetabulum, as it sometimes seems to be, the opposite iliac crest and anterior iliac spine will be lower, even if there is no difference in the actual length of the legs. In many cases of lateral curvature the pelvis is carried obliquely in sitting and standing from the effect of the malformed vertebral bodies and discs. The patient sits more heavily on one buttock and in walking may carry the knee slightly bent, on the side toward which the pelvis slopes. It is certainly easy to make mistakes, even if care is taken in the observations; and it would be well, as Dr. Beely suggests, to employ both levelling and the tape for greater certainty, as I did in the cases to be related. I am now inclined to think that pelvic obliquity alone is not so often the cause of true lateral curvature as I then supposed, for the reason, among others, that I have seen cases in which the lumbar spine rotated away from the short side instead of toward it, and also because one finds cases of such large difference in the length of the extremities without rotation, as in the examples to be related.

Case I.—A lady, twenty-three years of age, came from the South in March, 1890, to consult me about the shortness of the right leg. She said she was in good health and could walk several miles; but her physician told me she did not walk far on account of easily tiring. She knew of no sickness during childhood, except measles at the age of two years. When she was eight years old it was noticed that her back was not straight, and at fourteen that there was a slight peculiarity in her walk. Only the past winter had she noticed that her right leg was short. This patient was of sallow and delicate appearance; she walked with a slight limp, and the pelvis very markedly tilted to the right. She said her short leg—the right—was the stronger of the two, and that she was in the habit of standing on it, bending her left knee. Examination showed complete absence of any trace of present or previous affection of the joints, muscles, or nerves. Joint mobility was normal, the knee reflexes active, and the muscles were fairly developed, those of the right leg being distinctly larger and firmer. The right calf measured $12\frac{1}{2}$ inches, the left $11\frac{3}{4}$ inches. The distance from the anterior superior spine of the ilium to the internal malleolus measured on the right side 29 inches, on the left 31—a difference of two inches in favor of

the left leg. A part of this difference was below the knee, for as the patient sat with the soles on the floor there appeared to be a difference of about an inch in the height of the knees. Measurement from the head of the tibia to the internal malleolus revealed a difference of $1\frac{1}{8}$ inches in favor of the left; and from the great trochanter to the knee-joint $\frac{5}{8}$ of an inch. Standing with the hips and back exposed, the pelvis was seen to be much tilted to the right, and a book two inches thick placed under the right foot levelled the pelvis, and very nearly straightened the back. There was no abnormal rotation or deformity of the spine, and no true lateral curvature, but merely a natural compensatory bending when the difference was not made up. The *left* foot was smaller and slightly shorter than its mate. The arms were apparently equal in length from the acromion to the end of the middle finger. I have no note of the fact, but I have a distinct impression that this patient was right-handed.

Case II.—A large, well-developed girl of fifteen was brought to me from Western Pennsylvania in June, 1890, for advice in regard to her left hip. Between the ages of six and eighteen months she had had four attacks of convulsions attributed to teething. After that she was well, except for the ordinary children's diseases and a fall on the forehead at six years of age. She had never had symptoms of paralysis of the eyes, face, or limbs, and had never walked lame until recently. For six months it had been noticed that the left hip was smaller, and she had had a slight limp or peculiarity in walking for six months past, especially when fatigued. For two months she had had a slight headache and had tired easily; for a month her appetite had been less good than usual. She had no backache and slept well. This patient was rather nervous and quick in her movements, but was well nourished, and seemed to be in good or fair health. Her height was fifty-nine and a half inches in her stockings. There was little or no abnormality in her gait, but on standing with her back exposed the left iliac crest was seen and felt to be about an inch lower than the right. A book one inch thick placed under the left foot made up the difference and straightened the spine, which had no abnormal rotation. The distance from the anterior spine of the ilium to the internal malleolus measured $30\frac{1}{2}$ inches on the right side; $29\frac{1}{2}$ on the left. When the patient sat,

the right knee was higher, and the measurement from the top of the tibia to the internal malleolus was $\frac{5}{8}$ of an inch greater on the right side. The left (short leg) was more muscular and measured slightly more around the calf and above the knee. The knee reflexes were normal. This patient sewed with her left hand, but did everything else with her right hand. Her mother thought she was originally left-handed; the girl thought she was right-handed. There was no well-established case of left-handedness in the family. From the tip of the acromion to the end of the middle finger, the right arm measured three-quarters of an inch more than its mate.

The cases are of interest because of the large difference observed with no assignable cause; the absence of true lateral curvature; the fact that the short leg[1] was decidedly the larger and stronger, and that rather more than half the shortening was demonstrated to be below the knee.

Whether the longer or the shorter extremity in these cases was atypical is not clear. Both patients experienced relief by wearing the proper amount of cork on the shoe of the short side.

DISCUSSION.

Dr. Benjamin Lee, of Philadelphia, said that he was especially interested in the bearing of the paper upon the subject of lateral curvature. Cases are quite frequently met with in which the simple introduction of cork into the shoe to equalize the length of the lower limbs is all that is necessary to cause the supposed lateral curvature to disappear. He was unable to understand what the author meant by rotation of the pelvis producing inequality in the height of the iliac crests, although he could readily understand that if there were a slight contraction of the psoas and iliacus muscles on one side, this condition might be produced, and, therefore, the foundation for a true lateral curvature would exist.

Dr. F. Beely, of Berlin, said that it is not always rotation of the pelvis which is the cause of the inequality of the height of the an-

[1] Mr. Charles Roberts, in the Lancet for April 27, 1878, says: "The limb possessed of the least muscular development will be found the longer of the two."

terior superior iliac spines, but the lateral deviation of the pelvis, which we find frequently in lateral curvature of the spine, is perhaps as important. When the pelvis deviates laterally, the vertical distance of the head of the femur from the horizontal plane on which the patient is standing does not change on both legs to the same degree, and consequently there is an inequality in the height of the anterior superior iliac spines and an apparent inequality of the legs.

Dr. Albert Hoffa, of Würzburg, said that in connection with the subject of the inequality of the lower limbs, he desired to call attention to some cases which he had seen in recent years. A girl, fourteen years of age, was brought to his clinic with a diagnosis of congenital dislocation of the hip. There was shortening of seven centimetres on one leg. He could find no dislocation, and there was nothing in the history to indicate a fracture or an osteomyelitis of the head or neck of the femur. On excising the hip-joint he found that instead of the neck of the femur forming, as it ordinarily does, an obtuse angle with the shaft, it formed an acute angle. The specimen showed absence of the cancellated structure, and a sclerosis of the head and neck. The patient presented no evidences of rickets.

Dr. Ap Morgan Vance, of Louisville, said that he had only seen one case where there was undoubtedly lateral deviation due to crural asymmetry, and where the deformity could be overcome simply by addition to the short side, and this patient was a lady of good physique and enjoying excellent health. Lateral deviation of the spine is very common from a short limb, but cases where the cause lies in the ilium are rare. The subject was important, as general practitioners were liable to apply to these cases fixed dressings, when a raised shoe is all that is required. He had met with a number of such mistakes.

Dr. A. M. Phelps, of New York, was inclined to doubt the existence of lateral curvature of the spine as a result of shortening of one limb, for, after excision of the hip and other joints, the limbs so operated upon were decidedly shortened, and yet it was rare to find permanent lateral curvature. Many cases of apparent shortening were really due to twisting of the pelvis. He believed that the same

condition which produces the shortening of the limb also gives rise to the lateral curvature.

Dr. George W. Ryan, of Cincinnati, was of the opinion that the short leg was the result, not the cause, of the rotary lateral curvature.

Dr. John Ridlon, of New York, said that his clinical observations led him to doubt any evidence that had been adduced to show that the rotary lateral curvature was due to the short leg, or that the short leg was due to the lateral curvature. It seemed to him that where they coexisted in apparent causal relationship it was more probable that both were due to the same, perhaps undiscovered, real cause.

Dr. Taylor, in closing the discussion, said with reference to the remarks of Dr. Lee, that of course there could be no apparent shortening of one leg from rotation of the pelvis about its vertical centre, but he had reference to the apparent shortening produced by rotation of the pelvis through a vertical line passing through or near one acetabulum. Thus, when a lateral curvature patient stands in front of you, if the shoulders are in the same transverse plane, the pelvis may not be in that plane, but one anterior spine will be in advance of and lower than the other, or in other words, the pelvis is rotated about a vertical axis which passes through one acetabulum. This was capable of mathematical demonstration. He desired to state positively that there was no true lateral curvature in his cases, but merely a compensatory curve which could be obliterated by levelling. In his paper, he had called particular attention to the fact that the short leg was larger, stronger, and more muscular.

ON THE BEST MEANS OF PREVENTING A LOOSE JOINT, OR DANGLING LIMB, AFTER RESECTION AT THE SHOULDER-JOINT.

With an Illustrative Case.

By W. R. WHITEHEAD, M.D.,
DENVER, COLORADO.

Illness prevents me from attending the meeting of this Association, and also from furnishing much more than an abstract of my paper. I shall endeavor, therefore, as briefly as possible to state my case by calling attention to the main feature of this communication, and which is suggestive of excellent results to those who properly dread a too-loose joint after excision at the shoulder.

The main feature to which I allude, and which may in future be established as a principle of treatment in the excision of the shoulder-joint, is the use of an elastic pressure by means of a simple rubber bandage, five yards long and three inches wide, applied over the dressings like the third bandage of Dessault for fractured clavicle, together with the use of an immobilized Russian felt splint, shaped and fitted to the sides of the chest, arm, and forearm, as I shall briefly describe.

In all cases of shoulder-joint resections, the cotton bandage, however accurately applied and watched and readjusted, yields to the pressure of the arm. But with the rubber bandage, properly used, an elastic support and desirable elastic pressure are unceasingly applied during the healing process.

Case.—April 13, 1891, in the presence of, and assisted by Drs. George B. Packard, Lowery, and G. H. Gibson, all of Denver, I resected four and one-half inches of the humerus, as exhibited by

the accompanying specimen. Appended is the ball, the cause of the injury. Mr. P., aged about thirty-six years, of Dillon, Colorado, in the act of firing at a railroad robber, received from him a ball which split the head of the humerus and lodged deeply in the glenoid cavity of the scapula, and remained there for twenty months, or until the date of my resection of the joint, which was a few weeks after I first saw him.

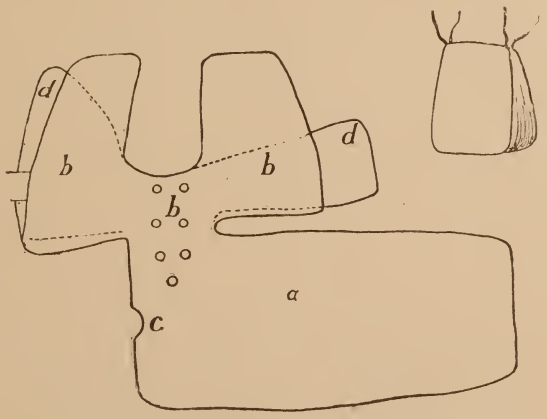
The operation was done with antiseptic precautions, but an old sinus gave me some trouble, leading to suppuration of the wound. The most trouble and delay, however, were occasioned by a firm fibrous and bony ankylosis, which made the operation quite difficult. Some days afterward the temperature arose and suppuration appeared. The wound was ripped open, and large, bold counter-openings made, and the one made during the operation enlarged, and large setons of gauze, saturated with balsam of Peru, of *good quality*, inserted. A tin gutter lined with oakum and secured with gauze bandages, and the limb supported by a pillow, formed the dressing each day, until a Russian felt splint and the elastic bandage were resorted to.

The muscles having their humeral attachments necessarily destroyed by the removal of the resected piece of bone were the supra-spinatus, infra-spinatus, teres minor and teres major, outward rotators of the humerus, and the subscapularis, a powerful internal rotator, some of the fibres of the latissimus dorsi and some of the antagonistic fibres of the great pectoral muscle attached to the upper part of the outer ridge of the bicepital groove. The long or scapula tendon of the biceps was detached, and its redundancy excised.

There remain then for functional use of the limb at the shoulder-joint, after atrophy of the parts has disappeared more or less, the following muscles: The great pectoral, most of the humeral attachment of which remained to pull the arm so strongly inward during the treatment as to require firm pressure to control this muscle, and which the elastic bandage helped to do. The other muscles coöperative in the after result were the deltoid, split and scarred by the line of excision; the coraco-brachialis, and the short head of the biceps, as somewhat supports of the limb and also flexors; also the long head of the triceps, although attached to the scapula, a movable bone.

Gradual retraction and adaptation of the arm to its new environment, together with the elastic bandage, was expected to do the rest in making the arm a good, serviceable limb, without the aid of any appliance whatever, which result is attained.

The following is a diagram of a piece of Russian felt, and shows how it should be shaped previously to moulding the felt to the arm :



For the right arm : consists of two pieces of Russian felt.

Diagram showing how to cut the two pieces of Russian felt for the splint : *a*, *b*, *b*, *b*, are all one piece; *d*, *d*, the piece to be afterward riveted to the arm piece and forearm piece, and which piece, *d*, *d*, with a strap and buckle secures the splint to the chest. The piece *a* and *b*, *b*, *b* is first neatly moulded to the forearm and arm; *a* represents the part to enclose the forearm from the elbow to the fingers; *b* represents the part to encircle the arm, or its shortened remainder after excision, and is wedged up well into the axilla; *c* shows a notch to prevent pressure at the elbow; *d*, *d* is a piece of felt, cut afterward and moulded to the chest; this piece, *d*, *d*, is riveted to the other piece of felt; a strip of galvanized iron interposed between the two pieces of felt is pierced by rivets and gives additional strength to the splint where it most needs it. Webbing three inches wide is attached to the ends of the piece *d*, *d*, and goes around the chest and buckles; a similar piece of webbing fastened to the forearm part of the splint passes obliquely across the sound shoulder, and all points of pressure by the webbing are protected by pieces of soft piano-felt underneath. This apparatus, with its straps, etc., properly adjusted, comfortably immobilizes the shoulder. One or two light gauze bandages are applied over the apparatus, and over the whole is applied the elastic bandage.

Every surgeon must be his own fashioner of such a splint, which illustrates one of the uses of the Russian felt as a surgical material. He may call to his aid the blacksmith and the harness-maker, and possibly the instrument-maker, but this would be making too much

of an improvised splint. An axillary pad is required in adjusting the splint.

It is now five months since the operation. The patient no longer uses the elastic bandage, and the cut end of the humerus is firmly maintained in close apposition with the glenoid cavity. Within the past month he has repeatedly driven a four-horse team; has thrown to a distance a fourteen-pound weight; lifted seventy-five pounds or more, and is improving so rapidly that I believe that within the next three or four months he will be able to abduct his arm at right angles to the body and carry his hand to his head with great ease. He has a useful arm which will become more useful, and in conclusion I will say that I hope this case will help to establish, as a principle, the use of the elastic bandage in the after-treatment of excision at the shoulder-joint.

REPORT OF A CASE OF SPINA BIFIDA,

With Partial Motor and Sensory Paralysis of Both Extremities, Complete Paralysis of the Sphincters of the Bladder and Rectum, Double Equino-varus, and Purulent Bursitis.

By H. AUGUSTUS WILSON, M.D.,
PHILADELPHIA.

Under modern asepsis operations are now freely and successfully performed for conditions which but recently would have been considered unjustifiable, and therefore the line of demarcation, as it were, is becoming more and more difficult of discernment.

The consideration of a single case presenting conditions the nature of which, by analogy, class it among the incurable may be of profit in these times of astonishing operative procedures. A case can no longer be abandoned as hopeless simply because it has serious conditions, but becomes so upon the exhaustion and failure of modern methods for its cure or amelioration.

James Morton, in his monograph on a *New Method of Treatment of Spina Bifida*, says that "It follows, also, that surgeons would not operate at all were they not able to offer themselves and others a hope, founded on experience, that favorable results are not only possible but probable."

And again, in referring to the character of cases suitable for the injection plan of treatment that he advocated, he remarks: "The child may have talipes, either slight or aggravated, or there may be paralysis of sphincters or of limbs. . . . . Paralysis of the lower limbs must be admitted to be a very serious complication, though it does not entirely exclude hope of benefit from operation. The prospect of prolonged survival is slender unless the family cir-

cumstances are such that every care and appliance can be commanded." (Page 196.)

In the report of the committee of the Clinical Society of London on Spina Bifida, a total of 242 cases has been analyzed.

These cases were grouped as follows:

Cases where no operation was done	60
Cases submitted to tapping	46
Cases submitted to ligature	16
Cases submitted to excision	23
Cases submitted to injection of iodine	26
Cases submitted to injection of iodo-glycerin	71
	242

The mortality in these cases varied according to the severity of the cases as well as the character of the remedial measure resorted to, and therefore is not considered to have any bearing upon the case I have to report.

The difficulty of arriving at a correct conclusion as to the comparative frequence of the occurrence of the combined conditions found in my case will be apparent from the following table of complications found in the 242 cases above referred to:

There were no complications	in 73 cases.
No complications were recorded	" 72 "
Talipes was present (variety not stated)	" 7 "
Talipes varus (not stated whether single or double)	" 12 "
Double talipes	" 1 case.
Right talipes valgus	" 2 cases.
Talipes calcaneus	" 12 "
Double equinus	" 1 case.
Valgus on one side and varus on the other	" 1 "
Paralysis of bladder	" 6 cases.
Paralysis of rectum	" 1 case.
Paralysis of both bladder and rectum	" 14 cases.
Paralysis of legs	" 35 "
Hydrocephalus	" 27 "
Imperforate anus	" 1 case.

The best that can therefore be ascertained is that in this collection of 242 cases of spina bifida some form of club-foot was also present in 40 cases, or 16½ per cent., the form most frequently occurring being

Talipes varus, 12 cases	5 per cent.
Talipes calcaneus, 12 cases	5 " "

In no instance was it recorded in this group that the combined occurrences found in my case were present in any one. It would appear, therefore, that this is a rare case, for if added to the foregoing, it is stated that Dr. Demme found that there were only 57 cases of spina bifida in 36,148 births, and Chaussier 22 in 22,293 in the Paris Maternity.[1]

These statistics would indicate that there is one spina bifida to 1013 births.

Briefly stated the case, a photograph of which shows the external appearances, was a colored child, aged four years, an only child of healthy parents and having been at born full term. Careful inquiry

[1] Trans. Clinical Society of London, 1885, vol. xviii. p. 339.

was made in regard to etiology, but there was no hereditary tendency nor even maternal impression.

The spina bifida was directly over the last lumbar vertebra, and the pedicle measured nine and one-half inches in circumference while the tumor proper was one-half inch less in circumference. It has generally been conceded that the prognosis in cases of spina bifida was in proportion to the relative size of the pedicle and tumor in that the smaller the pedicle the fewer nerve filaments would be embraced within it.

The tumor was hard and dense, except in one spot about half an inch in diameter in the posterior inferior quadrant, where the covering was extremely thin, tense, and glistening. At this point there was frequent oozing of serous fluid, easily increased upon pressure and almost always perceptible when the child sobbed.

The incontinence of urine and of bowel contents had not been observed by the mother until recently, for she thought it was "badness," but it had been invariable and constant from birth. All the flexor and extensor muscles of both legs below the knees were more or less completely paralyzed, and when electro-muscular contractility was present at all it was extremely feeble, the child possessing but slight voluntary muscular power in any of these muscles.

There was complete anæsthesia of the foot, ankle, and calf on the right side, which was present, although less marked, on the left. So impaired was the sensibility of both legs in their whole lengths that it was found to be impossible to map out the regions that were insensible.

As shown in the accompanying photograph there was present extreme double equino-varus, both feet being rigidly fixed in the positions shown. There was contraction of the tendons of the anterior tibial muscles and of the tendo Achillis on both sides, but these yielded upon the application of force, and it was clearly apparent that there existed osseous malformation which prevented a reduction of this deformity.

By firmly locking the knees the child was able to stand beside a chair or other support, but made no effort to walk or progress in any other than the creeping position. This effort to assume the erect posture had developed bursæ or supplemental soles under the distal extremities of the external malleoli upon which the child stood.

These bursæ gradually assumed a purulent form, and to relieve the suppuration the ordinary methods resorted to with immediate recovery in uncomplicated cases was resorted to. No artificial anæsthesia was required to freely incise the skin and remove the pus therein contained. Chemical antisepsis by bichloride of mercury 1 : 1000 douche rendered the parts clean and healthy in appearance. Antiseptic dressings were used and an early union by first intention hoped for.

During the ensuing six months that the case remained under my observation not only did the suppuration positively refuse to yield but the incised wound never cicatrized. A hard ring of exfoliation accumulated around the edges of the incision between the periods of dressing. In regular order and with persistency various antiseptic measures, including peroxide of hydrogen and pepsin, were resorted to, not only to control the suppuration but to induce closure of the wounds, but all without avail.

The possibility of there being a necrosed bone origin of the suppurating bursitis was exploded upon careful investigation.

At intervals of three to four weeks at first, and more frequently later, abscesses developed in other parts of the legs and repeatedly in the external genitalia; the latter however yielded promptly to incision and appropriate treatment.

An indication of the defective circulation in the feet was found in the feeble bleeding of the incisions referred to, and was partially anticipated from the cold, clammy feet and ankles.

The failure of the incisions to heal, or to assume even an approach toward healthy action, seemed to me to contra-indicate any extensive bone operations upon the feet, although it was clearly apparent that nothing less would entirely correct the deformity. Even tenotomy of the contracted tendons previously referred to was not attempted for the same reason, and therefore surgical interference was deemed clearly impracticable without taking unwarranted risks, in fact with a positive certainty of non-union.

The application of mechanical force by leverage was resorted to, and while the feet yielded somewhat it was found that great tumefaction was present wherever pressure was necessary, and the application of retention apparatus of any form was rendered impossible by threatened sloughing. A method of gradual stretching by ap-

propriate apparatus was likewise abandoned in turn. With the faintest possible hope of at least relieving the severity of some of the conditions present, attention was directed to the spina bifida, which in turn was subjected to such methods of gradual pressure as were found to be successful in less severe cases, such as pressure by a pad and elastic bands, and collodion, but no matter how gently applied were unbearable. As a final test, with a view of the possibility of an amelioration by the injection of iodo-glycerin, a preliminary puncture of the spina bifida was made in the manner recommended by James Morton, but convulsions of a mild form showed that even this must be abandoned.

Although there existed no decided hydrocephalus there was a perceptible bulging upward at the site of the anterior fontanelle. The child was alive and in the hopeless condition recorded two months ago.

This case may have some bearing, if added to others, in determining more accurately the etiology of congenital club-foot. In this case the mother says it was born club-footed.

In a case recorded by Mr. Hutchinson (*Arch. Surg.*, 1890, vol. i. p. 169) of spina bifida, "The child was brought to me very early in infancy. . . . . Was well developed, and its lower extremities, which I carefully examined, appeared perfect. . . . . Five years later its feet were in the typical position of equino-varus. The sacral tumor (spina bifida) was no larger than in infancy and gave no trouble."

DISCUSSION.

Dr. L. A. Weigel, of Rochester, said that he could sympathize with the author in the trouble he had experienced with the case reported, as he had a similar one. In his case, there was a spina bifida about the size of one's first, and when the child was seven weeks old an unsuccessful attempt was made to close the spinal canal by means of periosteal grafts. There subsequently developed an equino-varus of the right foot, and a calcaneo-valgus of the left foot; the muscles of the legs were very much atrophied, but the patient was thoroughly well nourished. There was no paralysis of the bowels or

of the bladder. The case was brought to him at the age of four years for the purpose of having the club-feet corrected. The slightest pressure gave rise in a few hours to ulceration, so that but little could be accomplished by the usual mechanical means. A tenotomy of the right tendo Achillis resulted in prompt union, and ultimately in a correction of the deformity, so that now the child is able to walk on the sole of the foot. A recent tenotomy for the relief of the valgus of the left foot has so far yielded a good result.

Dr. Hoadley, of Chicago, said that he had performed an operation upon a case of spina bifida with the best possible result. The child was but two and a half months old at the time of the operation, and a large tumor occupied the lower part of the lumbar region. The patient was placed on the face with the head inclined, and the sac freely opened. The nerve filaments were visible, and some of them were attached to the central part of the tumor. He made no attempt at repairing the deficiency in the vertebræ, but simply turned up sufficiently large flaps of dura mater on each side, and brought them together with a continuous silk suture. In making the skin-flaps he had inadvertently allowed portions of the dura mater which lined the sac to remain on their under surface, and these secreted so much fluid that it caused the flaps to bulge. After three or four days, the excess of fluid was evacuated by the introduction of a probe between the sutures. It is now two and a half years since the operation, and the tumor has never returned.

Dr. Newton M. Shaffer, of New York, had a case of spina bifida at present under observation which was quite unique, in that the tumor lies between the fifth and eighth dorsal vertebræ. It is small and elastic, and there is almost a circular gap in the spinal column. There is a partial motor paralysis on the left side. The case had been seen by a number of surgeons, some of whom had considered it to be a rhachitic spine.

Dr. H. L. Taylor referred to a case of spina bifida with talipes equino-varus of the left foot and partial anæsthesia of the left foot and leg, which came to him for the correction of the club-foot. This was successfully accomplished by the use of a brace exerting continuous leverage, but much annoyance was experienced from blisters and excoriations, even when the force was carefully and gently applied.

CONGENITAL CLUB-FOOT WITH ABSENCE OF THE GREAT TOE AND THE CONTIGUOUS BONES OF THE INSTEP.

By T. M. L. CHRYSTIE, M.D.,
NEW YORK.

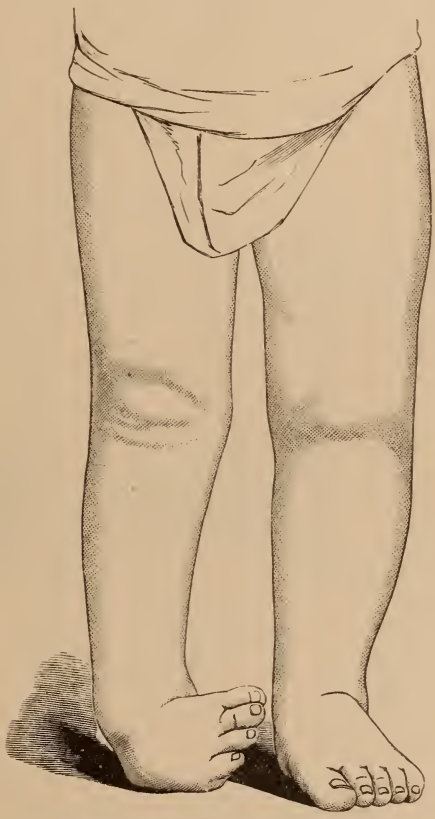
The case is of interest for its bearing upon the causation of congenital talipes of the equino-varus variety, since there are absent the parts which, it is supposed, produce the varus deformity of the tarsal arch, or instep. The twist or varus of congenital talipes is said to be due to the drawing of the inner side of the foot upward and backward toward the leg by the contraction of the two tibial muscles, whose tendons, passing respectively in front of and behind the inner malleolus, are inserted at the inner margin of the sole of the foot; the tendon of the tibialis posticus being inserted at the inner and under surfaces of the scaphoid and internal cuneiform bones, and that of the tibialis anticus at the inner and under surfaces of the internal cuneiform bone and the base of the metatarsal bone of the great toe. In this case these muscles are absent, as well as the bones, except the scaphoid, affording attachments for their tendons, yet there is, as shown by the photographs, an otherwise typical case of the deformity, the correction of which had been unsuccessfully attempted during more than two years.

The child, B. M., aged two and a half years, was brought to me February 14, 1891. He was carried, though I was told he could walk while wearing a shoe into which was incorporated a steel structure; but a few hours' use of this made the apex of the varus too sore to permit its continuance. The deformity of the foot attracted so much attention that the presence of only four toes was not usually noticed. The gastrocnemius was firmly and extremely contracted, but the front part of the foot was so twisted upward and inward that the patient by placing the foot in advance and throwing

back the knee could set his weight on the posterior part of this foot sufficient to steady his body, but not securely enough to stand or walk. His efforts in this direction were damaging the knee and upper part of the leg.

Absence of the first row of the phalangeal bones and the first shaft of the metatarsus was made out at the first examination, but the absence of the internal cuneiform was discovered after correcting the deformity.

Fig. 1.

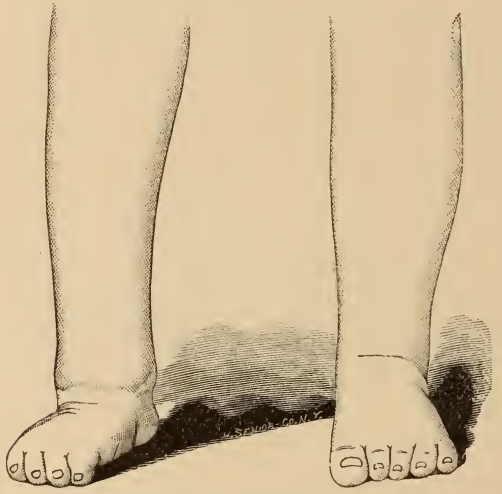


From photograph of February 20, 1891.

Treatment was begun February 20, 1891, by partially correcting the tarsal deformity by hand, and placing the so-corrected foot uncovered in a steel brace bearing on inner side of foot and leg,

with steel sole pressing the plantar surface of the metatarsus upward, the counter-pressure coming from a web-strap passing over the tarsus aided by a compress; the leg firmly grasped by a lacing of leather cut to include the external malleolus. The brace was removed twice in twenty-four hours to bathe briefly with a solution of alcohol and tannin, but the foot was not allowed to lose any of its position. As the foot was gradually forced out of its deformity corresponding changes were carefully made in the apparatus. In a week the brace was adjusted to remove the contraction of the gastrocnemius muscle—much of it done by manual force at two or three

Fig. 2.



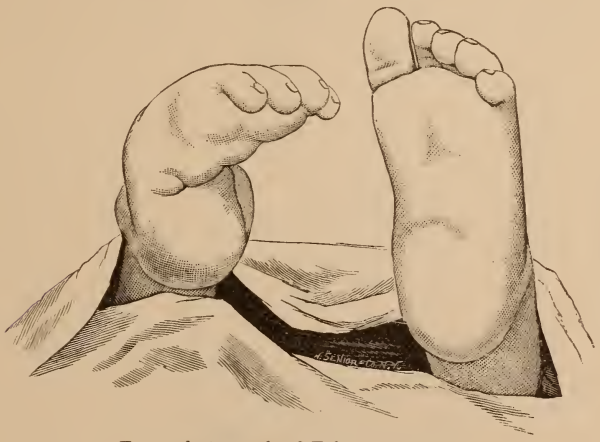
From photograph of September 12, 1891.

sittings, and at the end of four weeks the foot was in correct position. There was not any pain, discomfort, or chafing, and after the first week the child walked readily. The resistance in this case was as firm as in another case of congenital talipes equino-varus, aged one year, under treatment at the same time, where there had not been any arrest of development and the tibial muscles were present and strongly contracted. The foot in each case furnished similar resistance to correction, and the same successful result in each under similar treatment demonstrated what has always seemed to me

apparent, that the contraction of the tibial muscles is not the obstacle to overcome and that the division of their tendons is unnecessary.

The child is active and intelligent, and in other respects well developed and healthy; he has two older brothers well formed and healthy, except a recent indirect hernia in the second boy. His

Fig. 3.



From photograph of February 20, 1891.

Fig. 4.

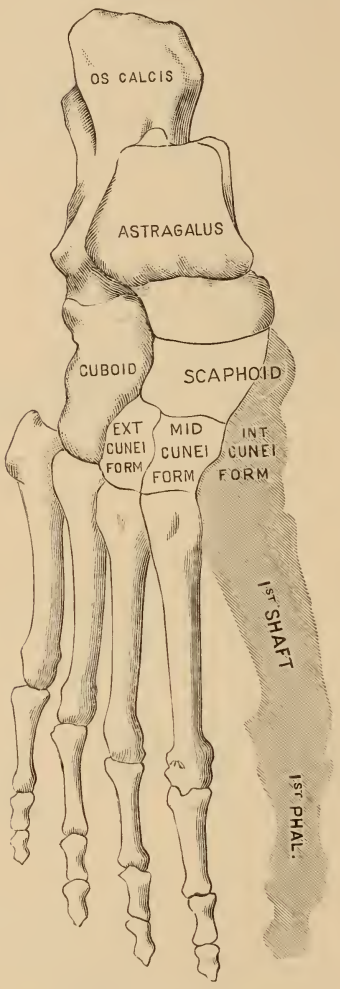
From photograph of September 12, 1891.

mother is healthy and well formed, though small in height; pregnancy natural, except the mother did more sewing than usual during its latter part; nothing unusual attending birth. The father, I am told, presents deformity at upper part of the spinal column, dwarfing him, but otherwise he is active and in good health, a dentist by occupation. The mother's uncle had hare-lip, and one of his children has extensive arrest of development of both upper and lower

extremities, though in other respects healthy and now grown to adult age.

The photographs show the foot before and after the correction of the deformity. The patient can flex and extend his remnant of a

Fig. 5.



Shaded parts indicate bones absent.

foot and has now use of limb and foot without any defect of gait. The function of the missing flexor muscles of the foot is executed

by the extensor communis digitorum. The right leg, below the knee, is three-quarters of an inch less in circumference than its mate, owing to the absence of five of the thirteen muscles of the leg. The great toe is responsible for the absence of three—the peroneus longus, flexor longus, and extensor proprius pollicis ; the first shaft of the metatarsus and internal cuneiform are responsible for the absence of the two tibial muscles. Measurement about the malleoli shows six inches for both sides. The scaphoid is not fully formed and has not developed as has the rest of the foot since the removal of the deformity. The limbs are now the same length, but it remains to be seen if the right limb will grow at the same rate as its more favored mate. It now has a chance, though it has against it eighteen months of disability and injury from the deformity of the foot, the efforts to use the limb on so unsteady a base resulting in hyperextension and strain of the knee-joint with arrest of nutrition of the entire limb from the glutei muscles down.

DISCUSSION.

Dr. Hoffa considered the case interesting as showing that all cases of club-feet do not have the same causation. The cases reported were due to some fault in the very earliest stages of the development of the bones of the feet.

A CASE OF DOUBLE CLUB-FOOT, DOUBLE CLUB-HAND, AND MULTIPLE DEFORMITIES.

By WILLIAM E. WIRT, M.D.,
CLEVELAND, O.

I HAVE to report a very interesting case of double club-foot, double club-hand, and multiple deformities.

I notice in the *Transactions of the New York Academy of Medicine* that Dr. Gibney has reported a similar case—one that was under treatment at the Hospital for Ruptured and Crippled, New York City, while I was house surgeon of that institution. The case that I am reporting is of a more severe grade of deformity than the one reported by Dr. Gibney.

The child under consideration—a boy—was born in August, 1890, and was brought to my clinic March 17, 1891, he being then seven months old.

The child presented a condition of double club-foot, double club-hand, imperfect development and imperfect action at both ankles, knees, hips, shoulders, elbows and wrists. In the hands there were contractures of all the fingers. So that in this child there was not a perfectly acting joint in either the upper or lower extremities, except in the phalanges of the feet.

The feet were in extreme equino-varus.

The knee-joints and patellæ were rudimentary, and the latter displaced externally. The ends of the bones were smaller than they should be, and were irregular.

The legs were held extended, and could only be flexed through an angle of 30°. The latter part of this flexion caused a crackling noise distinctly audible.

The ligaments were lax, permitting nearly as much lateral motion as flexion. There was some knock-knee present.

The thighs were held flexed, and rotated outward. By force they could be flexed to 110°, and extended to 165°. Rotation was limited to one-half the normal arc. Abduction was permitted to but a small extent; adduction was somewhat greater.

The obstructions to motion in the lower extremities seemed bony and ligamentous, and not muscular or tendinous. The right limb was shorter than the left, and on that side the trochanter major was three-quarters of an inch above Nélaton's line. There was evidently a congenital dislocation of the hip on the right side.

At the shoulders and elbows the condition was very similar to that at the hips and knees, with the difference that there was more motion permitted in the upper extremities, and the obstruction was more of a muscular character, and less bony. The pectoral muscles were strongly contracted.

There was marked double club-hand, with imperfectly developed wrists. The hands and fingers were flexed with adduction at the wrists. The flexion in the fingers was due to contracture of the palmar fascia.

We have very little to account for this condition of the child. The mother and friends state that during the fourth month of pregnancy she had a very severe fright, caused by a disturbance on the street, in front of her home, during the middle of the night. She also claims that the child was much more quiet *in utero* than her other children were. Her relatives are healthy, and none are deformed. She has one other child, which is perfectly healthy.

The presentation at birth was the breech, the labor was tedious, and there was suspended animation of the infant. The head was large, unsymmetrical, and had a depression on one side. The child was very much emaciated, and seemed in great pain for four months (thought to be in the head by parents and attending physician), during which time it was very irritable. Even washing the feet or trimming the nails caused it to cry lustily. From the fourth to the seventh month the child picked up very much. But at seven months the child, though moderately plump, had a very marked undeveloped muscular system. It was unable to sit up unsupported, though there was some voluntary motion of the trunk. In the extremities the power seemed limited to a slight motion of the toes.

Recently I visited this patient and found much improvement.

The child is able to sit up, and endeavors to play. It voluntarily moves its lower extremities at the hips, and the upper extremities a small amount at each joint. At the knees there is a gain of 30° of flexion; at the thighs there is a gain of 10° of extension and 15° of flexion. In the upper extremities there is the same proportionate gain.

The intelligence, though below par, has improved; and it is now, at thirteen months of age, about as bright as a baby of seven months.

The feet and hands are about in the same condition as on the first examination, the mother in the meantime not permitting any treatment.

The sensitiveness and irritation in the extremities has very much decreased, so that washing and handling the feet seem to cause very little annoyance.

From being extremely emaciated at birth, the child has grown to be quite plump.

The head measures $18\frac{3}{4}$ inches in circumference, and is narrow across the forehead relatively to the occipital portion, which is broad.

I would invite discussion of the case, asking opinions as to treatment and prognosis, at the same time calling attention to the disinclination of the mother to have anything done.

OPEN INCISION ON THE CONCAVE SURFACE IN THE TREATMENT OF INVETERATE CASES OF TALIPES EQUINO-VARUS.

By B. E. McKENZIE, M.D.,
TORONTO, CANADA.

Having, since May, 1890, operated on nine feet by the employment of Phelps's method, I wish to record my results and state the particulars of my observations.

Fig. 1.

B A

Case I.—*May* 5, 1890. F. S., male, thirteen years of age; right foot. One of a family of eleven children, three of whom have

double congenital talipes equino-varus, for whom no treatment has been adopted. As shown in A, Fig. 1 (taken from plaster casts), the feet are retained in a position of great displacement, the walking surface consisting of the anterior extremity of the calcaneum, the anterior end of the astragalus, the cuboid, and the base of the fifth metatarsal. Over the astragalus and os calcis are bursæ, very large and tender. The cuboid is not determined with certainty, but seems to be dislocated internally and toward the inferior surface of the os calcis. The calcaneum is so nearly in direct line with the leg, and the bones anterior to it so completely displaced that the largest bursa is developed directly over the anterior end of this bone. There is very little motion at the astragalo-crural joint. The os calcis makes an angle of about 135° with that of the leg, and is much rotated, having the point of attachment of the tendo Achillis much to the inner side of its normal place. Dorso-plantar motion is more marked at what is evidently a joint formed between the scaphoid and the internal surface of the astragalus. The distance from the external malleolus to the tip of the little toe is seven and one quarter inches, that from the internal malleolus to the tip of the great toe is four and a quarter inches.

June 13. Operation. An incision was made commencing half an inch in front of the inner malleolus and carried downward two inches extending nearly half-way across the plantar surface in the angle formed by the flexion of the anterior portion of the foot. (Fig. 2, A and B) In this incision were cut skin, fascia, tibiales anticus and posticus, the two inner divisions of the plantar fascia, the abductor pollicis, the flexor brevis digitorum, and the internal lateral ligament. At each step during the operation strong manual force was employed to move the anterior sortion of the foot outward and to rotate so as to bring it into normal line with the os calcis and astragalus. A strong ligamentous band connecting the inner malleolus with the scaphoid having been cut, a new articulation was opened. When the varus was corrected four bones were found to enter into the formation of the new joint, three forming a cup-shaped cavity in front and at the inner side, the other being the anterior and inner surface of the head and neck of the astragalus. The former were the scaphoid and two cuneiform bones.

Fig. 2 shows the foot after operation allowed to lie unconstrained while the artist made his sketch. At K the large bursa is well seen. There is no necessity for its removal as it rapidly disappears during treatment.

Fig. 2.

There was very little hemorrhage, the vessels and nerves having been defined and avoided in making the incision. The wound was packed with warm moist strips of bichloride gauze and the same material used for covering the foot. These were amply covered with absorbent dressings and secured by a flannel roller. The foot now being well everted, it was held in position by a gypsum bandage extending to the knee. This dressing remained in place nineteen days, during which time the temperature did not rise above 99.4°. Subsequent dressings were applied in a similar manner, except that the packing was not kept in the wound. Healing continued without any unfavorable circumstance.

September 1. The wound has for some time been completely healed, but a considerable depression exists in the foot at that part.

November 4. The tendo Achillis was cut and the foot flexed by manual power, so as to form an angle of 100°, and incased in gypsum.

21*st*. Plaster removed and flexion increased to a right angle, and casing reapplied, foot being well everted.

CASE II.—*January* 21, 1891. Same patient; left foot. The incision was commenced lower down than in the right foot. The wound was not so extensive and greater manual force was employed. Hemorrhage was very slight and the dressing adopted was the same as in Case I., except that the wound was not packed from the bottom, but covered over with bichloride gauze and permitted to fill with blood-clot. The subsequent history is similar to that of Case I., but occupied a shorter time.

In order to make further correction of the equinus in the right foot of this patient, the tendo Achillis was again cut, strong manual force employed, and the foot flexed to an angle of about 70°. During the application of the gypsum bandage an unusual deformity was observed, a projection backward being noticed a little distance above the heel, separation of the crural epiphysis no doubt having occurred. The dressing was completed, the foot and leg being retained in the best position attainable and allowed to remain six weeks.

March 15. The tendo Achillis of the left foot was cut and flexion well within the right angle was produced.

In May this boy was dismissed wearing boots such as shown in Fig. 3, able to walk fairly well. Fig. 1, B, shows the condition of this patient in August last.

CASE III.—*September* 12, 1890. J. S., male (brother of former patient), eleven years; right foot. Position and condition much as in former cases, but there was more movement at the mid-tarsal and at the astragalo-crural joints. (Fig. 4, A.)

Following Phelps, the tendo Achillis was cut as the first step in the operation, otherwise proceeding as in Case I. The varus was over-corrected, the foot flexed to a right angle and thus retained by a gypsum bandage.

20*th*. Sixteen hours after operation it was evident there was too

much constriction caused by the dressings, and the plaster case was cut open. The circulation not being sufficiently restored, the dressings were removed forty-eight hours after operation and several large blisters were found on the dorsum of the foot and above the heel. The temperature rose to 102.8°, pulse 100. There was much

Fig. 3.

swelling of the foot, and superficial though widely extending sloughing occurred on the dorsum and over the tendo Achillis, the latter extending so deeply as to threaten destruction of the tendon.

October 14. For about a week we have been able to apply dressings everting the foot and retaining it in an improved position, the parts from which the sloughs separated being nearly healed. During subsequent dressings it was found necessary to handle this foot with great care, as sloughing very readily occurred.

Case IV.—*November* 15. J. S., left foot. Operation by incision commencing in front of the internal malleolus and extending to the plantar surface, leaving section of the tendo Achillis to a later date. In May this patient was discharged having the left foot perfect in appearance and having flexion and extension movement through an arc of 30°. The right foot also was in good condition, but slightly incurved at the medio-tarsal joint. Before permitting him to walk he was well fitted with boots, such as those worn by his brother (Fig. 3).

In Fig. 4, A, B, and C, the condition of this patient is shown at the time of dates annexed.

Case V.—*September* 10, 1890. A. J., male, fourteen years of age; talipes equino-varus paralyticus of right foot. Had tendons cut and some further treatment when he was two years old. Has worn some form of club-foot shoe for several years, and now walks on the outer side of the foot, the weight being borne chiefly on the

Fig. 4.

A B C

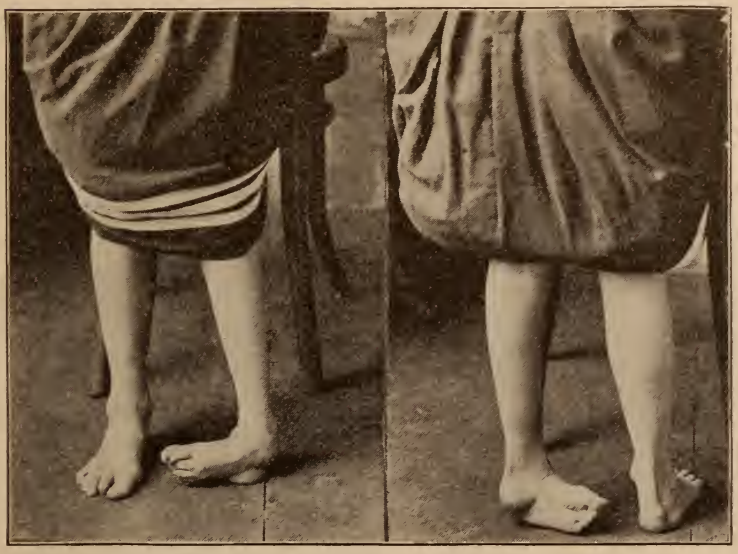
September, 1890. May 4, 1891. May 9, 1891.

base of the fifth metatarsal and cuboid. The foot is very resisting, permitting very little rectification by manual effort. Operation in two stages, allowing several weeks to entervene between the times of correcting the varus and the section of the tendo Achillis. In December this boy was dismissed having the foot in good position, but unable, because of paralysis, to flex the foot. This patient soon passed from observation, so that I have not been able to note the further progress of the case.

Case VI.—*February* 1, 1891. M. M., female, thirteen years of age; left congenital talipes equino-varus (Fig. 5). Operation as in

Case I., leaving the cutting of the tendo Achillis until the varus had been corrected. During the treatment of this case a small, but troublesome slough formed over the head of the first metatarsal bone.

Fig. 5.



Patient dismissed July 1, 1891, the foot being in good position and having power of flexion and extension through an arc of nearly 30°. Can now walk and run without discomfort. (Fig. 7.)

Cases VII. and VIII.—*June* 15, 1891. A. H., female, fifteen years of age; double congenital talipes equino-varus. Tendons had been cut when a child; the heel now comes to the ground in walking, but the varus is extreme, the feet rigid, and the bursæ large and very tender. Both feet operated upon and the varus over-corrected, the feet being extended as much as possible on the leg. The wounds have healed, but the patient is not yet walking.

Case IX.—*September* 1, 1891. H. H., female, fourteen years of age; congenital equino-varus of left foot, as shown in Fig. 6. Had no treatment previously. Incision made upon inner side of foot and varus corrected by manipulation. More hemorrhage in this operation than in the former ones. Pressure, however, and elevation of

the foot controlled it satisfactorily. The case seems to be progressing well.

Remarks.—Although the time elapsed since the first of these cases was operated on is short, still there are certain inferences that may be drawn and points that may be emphasized. All of them were strongly resistant to correction.

Fig. 6.

Fig. 7.

1. I think it much better that the tendo Achillis should not be cut until the varus has been fully overcome. By leaving this tendon intact the foot and leg are retained in such a relation to each other that the outer portion of the os calcis and astragalus become a fulcrum over which the foot may be pried, giving one great manual power to correct the varus, the leg and foot being arms of a lever moving in the same plane. If the tendo Achillis be first cut and the axis of the foot be brought into a position of right angle to that of the leg, then the prying of the foot in an effort to correct the varus is like turning a crank about an axis represented by the leg, as the plane through which the foot is now moving is not the same as that of the axis of the leg, but at right angles to it.

2. The hand is a much better instrument with which to make correction than any form of machine, and under the conditions named sufficient force can be applied to tear asunder or stretch all obstructions remaining when the knife has done its work by cutting the structures named in describing the operation.

3. It is better not to employ an Esmarch bandage or other obstruction to the circulation, as there need be but little hemorrhage and the oozing after operation will be much less troublesome, as the tonicity of the vessels is thus left unimpaired.

4. The operation, as pointed out by Phelps, is one of less danger than that by osteotomy, or than the removal of one or more bones. The resulting foot is more shapely, not having been shortened by the removal of any of its parts. (Figs. 1, 5, and 7.) All the articulations of the foot are left intact to increase its future mobility, whereas the other methods referred to interfere with this function to a greater or less extent.

5. Assuming that the correction of both varus and equinus has been sufficient, relapse may be prevented by two very simple means. (*a*) There should be worn in walking a shoe having the sole much thickened and shelved outward at the outer side, while the part pressed upon by the head of the first metatarsal bone is supported by a strong counter, thus made powerful to resist the tendency of the anterior portion of the foot to move inward. The portion of the sole under the os calcis should be made broad and low so as to give a secure foundation and to keep the foot well flexed within a right angle (Fig. 3). (*b*) At night a very simple retentive shoe should be worn.

6. In children younger than those whose cases are here reported, it will seldom be necessary to make the open incision, rectification being possible by manipulation alone, or by manipulation after subcutaneous tenotomy and fasciotomy.

Appended is a table showing results, so far as they may be stated at this time.

No.	Foot.	Age.	Wound healed in	Duration of treatment.	Result after	Previous operation.	Arc of flexion.
1	Right	13	7 weeks	1 year	15 months, good	No operation	30°
2	Left	13	4 "	4 months	7 " "	" "	30
3	Right	11	4 "	8 "	1 year, "	" "	35
4	Left	11	3 "	6 "	10 months, perfect	" "	45
5	Right	14	2 "	Passed from observation after 3 mos.	.....	Tenotomy	
6	Left	13	5 "	5 months	.....	Mechanical	
7	Right	15	3 "	Still under treatment.	.....	Tenotomy	
8	Left	15	3 "	" " "	.....	"	
9	Left	14	Dressing not yet removed.	" " "	.....	No operation	

DEFORMITY FOLLOWING EXCISION OF THE KNEE-JOINT.

By JOHN C. SCHAPPS, M.D.,
BROOKLYN.

The treatment after excision of the knee-joint has usually been lightly dismissed by those commonly regarded as authorities on operative surgery. The literature of the subject, with the exception of some recent works on orthopedics, gives the impression that, as in compound fracture, all that is necessary to secure a firm bony support is a few weeks' immobilization. These two cases, which are typical of a large class, serve to show that, on account of the after-treatment, if for no other reason, the operation belongs to the domain of orthopedic rather than to that of general surgery. They are also instructive as illustrating how readily a resulting deformity may be overcome within a liberal margin of time.

Two boys, aged respectively fifteen and seven years, were operated on in St. Mary's General Hospital, Brooklyn, one on July 10, 1888, the other on March 12, 1889. In both the point of attachment of the crucial ligament to the inner surface of the outer condyle appeared to have been the centre of the disease. In the younger an additional small abscess cavity was found at the epiphyseal plane of the tibia. In both cases only a thin slice was removed from each bone, and, as the scraped-out abscess cavities were small, the apposing planes were but slightly encroached upon. The first sections enabled me to bring the axes of the bones into an almost straight line, and rather than sacrifice any more bone, I permitted a slight amount of flexion. Wyeth's drills served to secure firm coaptation. Hard rubber drains were inserted at the angles of the wounds, and the limbs were immobilized by posterior steel splints. Healing was immediate and without suppuration. The drills were removed at the

end of four weeks. Two or three weeks later union was apparently firm.

The older boy was discharged ten weeks after the operation, wearing the steel splint and using crutches. Just how long he continued to use either is uncertain. Eighteen months after the operation he was readmitted. The limb was markedly flexed, but there was no motion to be observed on manipulation and no evidence of bone disease. An osteoclast, after the principle of Rizzoli's, was applied, and by strong effort with a powerful screw the limb was gradually forced into the same position as after excision. The parts about the knee were very elastic. There was no sudden yielding or other evidence of fracture, but repeated applications of the screw finally overcame the resistance so that the limb remained in the desired position when the force was removed. To over-correct the slight flexion that remained so that the limb could be put up perfectly straight seemed to require more violence than the soft parts would bear. Plaster-of-Paris was applied and continued for nearly ten months. During this time and for a month longer the patient went on crutches. Their use was gradually discontinued while the patient was kept under observation. At the end of thirteen months after the application of the osteoclast, or two and a half years after the excision, the patient had had no support for three months, and his weight had greatly increased. The flexion had not recurred, and he was discharged.

The younger patient left the hospital four months after the excision, but through an error the splint was removed. Six months later, or ten after excision, he returned. There was great flexion, and, as in the previous case, neither motion nor osteitis to be discovered. The osteoclast was applied, with the same result as before. The limb was put into plaster-of-Paris and patient directed to use crutches. He was subsequently treated at the dispensary connected with the hospital, and as his attendance was irregular, it is not known just how long the use of the crutches or plaster-of-Paris was continued—probably about three months. Seven and a half months after the osteoclasis, or more than a year and half after the excision, the patient presented at the dispensary. There was a re-flexion nearly or quite as great as before the use of the osteoclast. Neither motion nor osteitis was to be observed. A steel support, consisting

of bands behind the upper part of thigh and lower part of leg connected by lateral bars, was applied. Broad straps of webbing passed behind the bars and in front of the knee and tended to draw the knee back into the plane of the bars. The brace was put on simply with a view to prevent increase of the deformity. But the pressure thus applied was found to be sufficient to cause a gradual straightening, though hardly to the degree that existed just after the excision. After eight months' use of this apparatus it was gradually laid aside. Two and a half months after all support had been removed, or nearly two years after excision, the limb showed no tendency to yield and the patient was discharged.

Both these cases gave evidence of rhachitis to the extent of beaded ribs and large joint-ends. But there was neither bow-legs nor knock-knee in either, and at their ages rickets would hardly be expected to play any part. At the end of eight weeks manipulation gave every evidence of firm bony union. Whether the deformity which occurred when the limbs were brought into use was due to yielding of the newly formed reparative material alone or to that of the adjacent cancellous tissue is an interesting question. It is probable that callus from cancellous tissue is always softer or slower to ossify than that from hard bone, and that in these cases it was further modified by the condition of the epiphyses from which it came. But the bony surfaces had been so closely brought together that the amount of new material must have been too small to account satisfactorily for what followed. On the other hand, if the union had been as firm as the adjacent bone the result was a mass of cancellous bone nearly double in length that of a single epiphysis. This had been rendered even softer than normal by the congestion usually found around a tuberculous focus. Into each end of this soft mass was inserted one end of a long lever. In standing or walking the force was not transmitted vertically through the axes of the levers and their median cushion, but in such a way as to cause an increase of the already existing flexion. As the epiphyseal mass subsequently became firm enough to bear without yielding the increased weight still transmitted at a mechanical disadvantage, it is safe to conclude that the soft condition which had existed was due to the peri-necrotic congestion. This disappeared when the diseased tissue had been removed and the traumatism of motion abolished. The action of the hamstring

muscles has been regarded as a factor in the production of flexion, but though they may be powerful to increase already existing flexion after it has attained some degree, when there is little or none their action is probably very ineffective. Excision for dangle-leg or other conditions, in the absence of bone disease, appears to be less liable to subsequent deformity.

Clinically the results in cases similar to the foregoing should not be allowed to weigh too heavily against excision, for they are not necessary sequelæ. Mechanical treatment of osteitis of the knee can only be successful when carried out by faithful care on the part of the patient and his friends for an unknown number of years. In many cases this cannot be obtained. When it is obtained the result is frequently a joint which does well just so long as its functions are suspended, and which rekindles when protection is removed. If, after excision, the limb be put up in a perfectly straight position, and if mechanical support be maintained for a sufficient time—always much shorter than that required by purely mechanical treatment—the danger of deformity is slight. Should it occur, it may be corrected by means of the leverage afforded by the long bones. And while the operation is not always the very short cut to a cure that it has been represented, it has two claims that must be acknowledged. It abolishes the traumatism of motion, and removes the tuberculous focus which is a constant menance to limb and life.

DISCUSSION.

Dr. A. M. Phelps said that in 1884 he had published in the *New York Medical Record* a paper upon resection of the knee-joint. In the clinics of some of the most eminent of German surgeons he had repeatedly seen these cases relapse, and Schede, among others, had told him that they had abandoned the operation in children under the age of seven years. A study of the subject had led him to conclude that the relapses were due to the operation being performed upon the growing limb, to the placing of the limb in the deformed position with a view of favoring locomotion, and also to insufficient cutting of the hamstring tendons. He had resected as

much as two or three inches of the hamstring muscles without risk or injury, and this procedure, together with over-correction of the limb, and the use of appropriate apparatus, will prevent the recurrence of deformity. If the limb be placed in the flexed position, as it grows the angle increases, and the weight of the body making greater pressure at the angle causes an irritation which probably results in a hypertrophy of the bone at the angle, and this aids materially in causing a relapse. He would not think of doing an excision in a case under ten years of age. In a patient, now fifteen years of age, who was operated upon by Dr. Sands when at the age of ten or twelve years, flexion has occurred, not at the point of resection, but at a point on the femur two inches higher up.

Dr. Shaffer thought there was a class of cases occurring in adolescence, and quite distinct from those where the epiphysis is rapidly growing, where the relapse occurs as a result of an incomplete removal of the disease.

Dr. Hoffa did not think that the relapse is the result of the limb continuing to grow, but to an incomplete removal of the disease. Some years ago he had exhibited and reported upon about twenty patients before the Surgical Congress in Berlin. These cases had been operated upon by various surgeons in the hospital at Würzburg, and examined from ten to twenty years afterward. A study of these cases had convinced him that relapses could be avoided by a thorough removal of the diseased tissue. When a tubercular focus is near the epiphyseal line it causes an irritation at this point resulting in an arrest of growth. When an excision is performed in early life and *all* the disease removed, marked shortening will not occur; in fact, the limb may even become longer as a result of the removal of this irritation. The extensor muscles are in a state of atrophy and the superior strength of the flexors ultimately brings the limb into a flexed position. We must endeavor to secure bony union with the limb in a straight position.

Dr. F. Beely thought that the contraction of the muscles exerted less influence than the weight of the body; and that the weight of the body exerts less influence when the patient is standing—more

when he is walking. When, in walking, the heel touches the ground and is kept there, the weight of the body acts in the direction of the femur, and at every step tends to flex the leg. The consequence of these oft-repeated slight movements is the flexion of the leg. When one over-corrects the position of the limb, the patient walks in such a way that he moves the limb at first forward and then backward. This movement in walking may produce an exaggeration of the already over-corrected position. An apparatus which would prevent the recurrence of the deformity ought to be such as to relieve the limb from the weight of the body.

Dr. H. L. Taylor wished to dissent from the opinion which had been expressed, that the free division of the hamstrings was of no consequence, for, even though the knee-joint be ankylosed, by such a resection the point of origin is changed to the point of insertion, and these muscles can still assist in balancing the pelvis.

Dr. Phelps said that the hamstrings did not operate until after the limb had begun to assume the flexed position, and if the limb were perfectly straight and bony ankylosis present, he did not think the hamstrings would act upon the pelvis. He approved of Dr. Beely's explanation of the relapses, and in his own apparatus provision is made for removing the weight of the body from the limb. The cases which had been over-corrected had remained straight, and hence it would seem that this position was perfectly safe.

Dr. Griffith, of Kansas City, said that he had had a similar experience with flexion occurring after knee-joint excision, and in his last two cases, in order to avoid this, he had not cut the hamstring muscles, but had carefully removed all the disease, taking care to preserve, if possible, the inelastic patellar ligament, and hence, the quadriceps. The division of the hamstrings he considered as of no importance.

Dr. Schapps, in closing the discussion, said that in many cases under ten years of age, seen in dispensary practice, there is very little that can be accomplished by ordinary mechanical treatment, whereas he believed excision would result usually in a cure within two years.

GONORRHŒAL RHEUMATISM: EFFECTS AND TREATMENT.

By BERNARD E. BRODHURST, F.R.C.S.,
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It is certain that gonorrhœal, or urethral, rheumatism is in the first instance invariably preceded by a specific discharge. Subsequent attacks may or may not be preceded by a discharge; but the first attack is always preceded by a specific urethral discharge. A second attack of articular inflammation may be caused by the use of the bougie, or by an act of coition, or by any other form of irritation of the urethral canal.

Exposure to wet and cold weather, the gonorrhœal discharge being present or being about to appear, tends to induce this form of articular inflammation. Considerable effusion into the affected joints takes place accompanied with great pain; but, although tension may be very great, suppuration never occurs. Many joints usually become inflamed simultaneously, and all may recover perfectly and without leaving behind any ill results. Every fresh attack of inflammation takes more effect than the preceding one, and seems to be more virulent in its character; and it is probable that, although on two occasions, perhaps, the joints may resume their normal appearance and their functions, a third attack may leave the patient lamed. It is common that all the joints shall recover well, except one; but that one remains stiff and immovable.

When pain is first felt and swelling appears, the affected joints should be wrapped in lint covered with mercurial ointment, and they should be bandaged as firmly as can easily be borne, and the patient should be brought rapidly under the influence of mercury, preferably by inunction. With such treatment, pain and swelling quickly disappear and the joints resume their normal condition. At this stage

passive motion should be instituted, to ascertain that the motion of any affected joint is free; for lymph will have been deposited on the synovial membranes, through which adhesions form which prevent motion. These bands soon become firm, and resist any attempt that a patient himself can make to move the joint.

These constitute false ankylosis.

The mercurial treatment, to which I have referred, if resorted to in the onset of the inflammatory stage, never fails; swelling subsides as the mercury takes effect.

The large joints are those which are most frequently affected, namely, the knee-, the hip-, the elbow-, and the shoulder-joints. Every joint may, however, become inflamed, and ankylosis may result, not in one joint only, but in every articulation in the body. Such a case I have had under my own care. I saw this patient with Dr. Lever. He had had three attacks of gonorrhœal rheumatism, each of which was preceded by a specific urethral discharge. He recovered the use of his limbs after each attack, but each occasion required longer time for recovery than the preceding; and, indeed, the third attack left a certain amount of stiffness which was never entirely removed. This, however, appeared to be muscular rather than articular, and it was only felt after a long rest in one position. At length he married; and after marriage he was seized with violent inflammation. Every articulation was inflamed and became ankylosed. At this time I saw him. He could neither move his head, nor any limb, nor could he masticate. He lay without power of motion, like a log.

When, after inflammation has ceased and passive motion has not been employed, adhesions remain and become firm, force is needed to restore mobility. If this force is employed in extending the limb, dislocation may be produced, or at least some displacement of the articular surfaces may occur. Force should therefore always be used in the direction of flexion. When force is thus employed, no injury can accrue to any structure. And if this operation has been long delayed, so that contraction of the flexor muscles cannot otherwise be overcome, their tendons should be divided. But before force is applied to rupture adhesions, the punctured wound should be allowed to heal; for otherwise they may readily be extended into lacerated wounds from three to four inches in length.

In this manner, mobility is very quickly regained. The operation is entirely successful, and it ranks among the most satisfactory in the whole range of surgery. Thus, I operated with Mr. Henry Lee on an elbow. Disease had been contracted in China, and several joints became inflamed. All, however, recovered except the elbow. This joint became perfectly stiff and immovable. Under chloroform, the adhesions yielded instantly and completely, and mobility was restored. In the course of one month, he returned to China having recovered the entire use of the joint. I met him accidentally three years later, and inquiring as to his elbow, he answered: "Really, I have forgotten which was the stiff elbow; both are alike," at the same time rapidly flexing and extending the forearms.

Again, I saw with Dr. William Wood a case in which disease had been contracted in Ceylon. In this instance the patient slept in the open air, had continued sleeping until after sunset, when he awoke cold and in great pain. He was carried with difficulty to his own room, for the hips, knees, ankles, and shoulder-joints were much swollen and dreadfully tender. The hip became so much swollen that it was supposed suppuration would occur. This joint became stiff and immovable; but all the others recovered perfectly. Sir Benjamin Brodie advised that he should arrange to leave the army, for he would not be able to follow his profession—he could neither ride nor walk, and "he would take his stiff joint with him to the grave." From Sir Benjamin's house he came to me, and I assured him that mobility could be restored. With very slight force the adhesions yielded and gave way gradually, so that the thigh, which had been fully extended, was flexed upon the pelvis. He suffered no pain and slept well without an opiate. Passive motion was used, and in some few days he walked about his room, and within a fortnight he walked upward of two miles without injury. In two months I presented him at the Royal Medical and Chirurgical Society, where he was examined by many, and especially by Mr. Coulson, who affirmed that he could not have believed that the hip-joint had ever been diseased, for the head of the femur moved perfectly in every direction, unless he had heard it from so many credible witnesses. Speaking immediately after the paper was read, in which this case was detailed, and before he had examined the patient, or knew that he was present or that he was an officer in the

Queen's service, Mr. Coulson affirmed that the case was impossible —to the great astonishment and amusement of my patient, who was sitting at my side. Immediately afterward he rejoined his regiment, and writing to me some four months later, he said: "I walk occasionally twelve and thirteen miles a day." And again later, he wrote: "I can sit in the saddle all day, without pain."

And again, I operated with Sir Prescott Hewett on the hip, where disease had been contracted in Russia, and also on another, from India; also, with Sir William Fergusson, on both hips and knees in a case from Bermuda, as well as in other numberless cases, where mobility has been perfectly restored.

Ten years ago, I had operated on upward of one thousand cases of fibrous ankylosis; and in no instance, either before that time or since, have I known of any accident, whether displacement or fracture, or inflammation, or injury of whatever kind.

ATROPHY IN JOINT DISEASE.

By E. G. BRACKETT, M.D.,
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The value of any symptom lies not only in its uniformity, but in the definite understanding of the relation of the etiology of its occurrence to the disease. The following paper has for its object the consideration of the relation of atrophy, both as a symptom and a result of joint disease. The constancy of its appearance, and its value as a diagnostic sign is never questioned, but this relation to the disease, especially in its etiology, has not received particular attention from a purely clinical standpoint, but has rather been ascribed to those causes suggested by experiments, but which in reality were but little more than illustrations of the well-known clinical fact that this atrophy does occur in all forms of joint disease.

There have been various theories advanced to explain the method of its occurrence, and which have at times been more or less generally accepted. Two have, of late at least, received but little attention, and were based on the propagation of the inflammation, one considering the wasting due to the extension of the inflammation to the muscles, and the other (advanced by Sabourin) to the extension of the inflammation to the nerve filaments, and its propagation through them, molecule by molecule, along the nerves, resulting in the wasting of the muscles supplied by them. Against these is not only the fact that it does not correspond to the clinical course, or to the distribution of the atrophy, but also that examination of these structures fails to show evidence of any such change.

The theory which has found the most favor supposes a nervous influence exerted through the spinal cord—*i. e.*, a reflex. Vulpian was the first to bring out a purely nervous-reflex theory, and says:

"In the majority of cases it must be classed among the atrophies called reflex—*i. e.*, among those which are a result of a change in such regions of the gray matter of the spinal cord, produced by irritation of the peripheral ends of certain sensitive nerves." What this change may be is not distinctly stated, but rather classed among the indefinite changes which, to explain a clinical fact, were supposed to exist.

Charcot inclines to this theory, but gives a more definite description of the changes which he considers to occur. It so nearly resembles the reflex theory of Vulpian, that it is practically but a modification or elaboration of it. He considers it as a spinal affection, consisting of a sort of stupor or inertia of the cellular substance, and which is brought about by the irritated articular nerves, through which the joint lesion has reacted on the spinal centre, and there modifies the centres in the spinal cord which preside over the nutrition of the muscles and the motor nerve. He claims the existence in the cord of a connection between the cells of origin of articular nerves and of motor and trophic nerves of the extensors, and so that when other than the extensors are affected, the irritation arising in the articular nerves has spread itself by diffusion to the other muscles. These are based on the assumption, that the morbid process in the joint exerts an influence on the trophic centres in the cord through the irritation of the nerves. The statement is purely hypothetical, and adopted rather because it seems to furnish an explanation, and not because it is borne out by pathological facts. On the other hand, it implies the absence of pathological change, which, if true, does not admit of proof.

In view of this theory, numerous experiments have been carried out, which have been urged as proof of this mode of causation. Prominent among these are those of Valtat, and of Cazin and Duplay. They illustrate a fact well established by clinical evidence, that in acute joint diseases atrophy occurs; but as there were no control animals, it can hardly be claimed that they do more. They are of value in determining that the atrophy is a simple one, and not attended by pathological change, either in the muscle itself or in the nerves or spinal cord. They do not show any definite proportion between the severity of the articular disturbance or its duration.

These were all acute traumatic lesions induced in healthy animals, which were kept in more or less confinement. On the other hand,

the cases seen in the clinical aspect are by a very large majority chronic, running a slow course, with occasional exacerbations, but which occur usually after the establishment of the disease, and not at its onset. They are of value for the purpose for which they were conducted, but they have in reality but little bearing on this subject, as it appears to us clinically. There is so decided a difference between the course of an acute and a chronic joint disease, that they cannot be brought together for comparison.

If it is to be grouped among the valuable diagnostic signs, its relation to the disease becomes of decided importance. If it is directly dependent on the joint disease and the influence exerted through the nervous mechanism, there should be a somewhat constant relation between the course of the disease and its development.

But since these theories are not based on pathological findings, we must turn to clinical evidence to confirm them. For this we have the fact in all forms of joint disease, of the occurrence of an atrophy to a certain extent, but beyond this there is little to uphold them. We find that the degree of this varies to a wide extent, even in the same stages of the disease; and in cases of long standing, affects all parts of the limb, including the bones.

It is also often noted that this atrophy does not bear any constant relation to the severity of the articular disease, to its duration, or to the amount of pain, and the grouping of some of these facts shows that there must be other factors which have a more or less constant influence on the causation of this condition.

In considering the influence of the severity of the disease, we must disregard those cases running an active virulent course, since in them are all the conditions which are to be considered. But in the usual case, running a mild course without the persistence of active symptoms, we find so great a variation of this condition that there must be a most potent factor in its causation, besides an irritative nervous influence.

Thus we often see in untreated cases, which have been allowed to use the leg, an atrophy which is only slight, but which is developed to a usual amount when the limb is immobilized in the course of treatment.

On the other hand, cases which have early been immobilized will often show a decided atrophy, and this in the absence of acute

symptoms. And also where all use of the limb has been prohibited, as by the use of the plaster spica, or Thomas splint, the degree of atrophy is much greater than with the use of apparatus allowing more freedom. That it is not due to the pain is shown by the fact that many of these cases in which the atrophy is decided, pass through the whole course of the disease with but very little and only occasional pain. Were the irritative influence of the inflamed joint the chief factor in occurrence of this wasting, these variations could not exist. In addition, if due to this cause, this nerve irritation should react more particularly on those parts connected with the joint. In place of this there is an atrophy nearly, if not quite, evenly distributed over the entire limb, and although it has been stated by some experimenters that the extensors are first involved, and to a greater degree, the clinical evidence will hardly bear this out. If this condition exists at all, it is to so slight a degree as to be of no clinical value.

The active factor which seems to bear the most constant relation to this condition is the amount of use allowed, or possible to, the limb. This theory of disuse has received but little attention, and has usually been dismissed by the various authors with the mention that it is not sufficient to explain the condition; but that it holds a most important place in the etiology, I feel we are justified in assuming from our clinical evidence, and not only from that which is seen in the early stages of the disease, but even more from the changes which occur later during the periods of growth.

In these cases, in the first stages of joint disease, we must estimate the effect of a partial disuse by comparison with other conditions which are met with at the same time, and it has been chiefly argued that it is not sufficient to cause the difference which is found to exist. Therefore, the relative effect of the various influences which are met with can be estimated only by the comparison of the degree of the atrophy under those influences which occur most frequently and uniformly. Thus we see that there is none of these factors the presence of which is followed constantly by any definite degree of wasting except this one of disuse; for cases with pain and with evidences of acute stages of the disease, show at times decided atrophy, and again but little. On the other hand, a decided atrophy appears when there has been none of the signs of active disease.

For example, I have the measurements of a case in which the sensitiveness of the joint compelled the treatment on a frame from the beginning of the disease, which appeared suddenly. In this both limbs were confined nearly to the same degree. The difference in measurement of the thigh was but one-half inch, and of the calf one-fourth inch, after several weeks of this condition; while in another in which there had been scarcely any sensitiveness or pain, but the treatment had been the confinement of the limb in a Thomas splint, the difference was two and three-fourths inches in the thigh, and one and one-half in the calf, with the wasting uniformly distributed.

Illustrative of the direct result of complete disuse is a case in which there had been the usual history of a slowly beginning hip-disease, but the child, an active boy, had been running about at will. At the beginning of treatment the atrophy was slight—under three-fourths of an inch of thigh and calf—in a boy of ten, although there was distinct articular disease. A plaster spica was applied, and on its removal after one month, the atrophy of the whole limb was so decided that the parents were with difficulty persuaded to allow the plaster to be renewed. There had been no increase in the disease, as shown by examination of the limb, or by the subjective symptoms.

But the objection may still be urged that although this reflex nervous disturbance may not meet the conditions under which this atrophy is found, the disuse is not sufficient. In two conditions we have illustrations of this, and under which we must look only to this cause for the difference in size—functional (so-called) diseases, and congenital dislocation.

In the former there is the limited voluntary use of the limb, but no diseased articular structure. In them it is usual to find an atrophy of the whole limb, which is not present at first but is developed during the course of the affection. For instance, a child of seven, of a distinctly nervous temperament, after three months of this affection, showed a difference of one inch in the thigh and three-fourths of an inch in the calf, which in a month after unrestricted use was begun had nearly disappeared.

In the instance of congenital dislocation we find the difference in proportion to the usefulness of the joint, and with a very loose joint the loss of development is decided, involving the entire limb uniformly.

For instance, a child of three, having so little impairment that only a slight limp was perceptible, showed a difference so slight that it was more easily determined by comparison of the appearance of the two limbs than by measurement. Another, where the laxity interfered decidedly with the usefulness of the limb, showed a difference of three-fourths of an inch of thigh and one-half of calf. Whereas another, a child of eleven, in which the limp was painfully prominent, had a difference of one and three-fourths inches in the thigh, and seven-eighths of an inch in the calf.

Therefore, I think that in view of these and the other clinical facts in the joint disease, this factor cannot be dismissed with the statement that it is not sufficient, but it must be ranked as the important one governing this phenomenon. And when we consider the physiology of muscular nutrition it is in direct accordance with this method of its causation. The maintenance of the normal blood-supply is the essential factor, both of the nutrition and development, and it is regulated mainly by the activity. The contraction of the muscle is its respiration and has been found to be attended by a tissue change (determined by examination of the return blood), and that there exists a direct relation between this and the repair or nutrition. In other words, the muscle depends on its work for the maintenance of its fully developed working conditions. Deprived of this, it suffers in proportion.

If the disuse has so great an influence in the occurrence of the atrophy in the early stages, the results of its influence can hardly be less decided in the later, and it becomes at this time most important. If we are correct in placing the element of use in this prominent position among the etiological factors, we should find later in the disease the further evidence of its influence, in the development of the limb.

If the result of the other causes, there should be an impaired development, in which those parts diseased should hold the most prominent place, and in proportion to the severity of the disease; but if in the greater measure due to the lack of the natural use, we must look to a general deficiency of development of all the parts involved in this temporary confinement. For this we must look to the limb after many months of treatment; and in doing so, the most prominent condition is that of shortening and muscular wasting,

the most valuable for us in this particular being the shortening, omitting those cases in which there has been such a displacement of the bone as to alter the usual anatomical relations.

There are three factors which can be considered in the etiology of this condition: (*a*) Bone destruction. (*b*) Reflex nervous influence, *i. e.*, an inhibition of nutrition. (*c*) The effect of immobilization. The two former need but a brief mention. That which occurs from destruction of the head of the bone is doubtless but very little. In the first place, the anatomy is such that an extensive destruction of the head is attended with but slight loss in length, and were there such loss it would be shown by measurement of the bone, but from a large number of observations I have found that this does not exist, and neither is the amount determined by the suppurative process.

Were this due to the reflex inhibitory influence from the irritation of the disease on the neighboring parts, then in those cases in which the disease early becomes quiet, and remains so, there should be but little loss of growth, and this loss should be confined to the vicinity of the affected joint, neither of which is the case. In place of this we find a loss of growth involving the whole limb, including the foot, almost equally distributed, and this is influenced more by the amount of use the limb has been allowed than by any other factor which we have in clinical evidence. The evidence of this is that, in addition to the slight degree of atrophy which is present in all forms of joint disease and in all joints, the degree of this is proportionate to the amount of use which has been allowed the limb, and with uniform distribution over the bones and soft parts of the whole limb, and the presence of the same condition under other circumstances, when, in the absence of disease, the limb has been restricted in the use.

To illustrate the general distribution of this lack of growth the following observations were taken. These were made on cases of chronic hip disease, taken in order as they appeared, and therefore represent, as nearly as any series can, the average case of this disease. They are of children between four and fifteen years of age, and with a disease of about two years and over. The measurements were taken of the femur, tibia, and foot of each side, as well as of the diminutions of the thighs and calves. The average shortening was found to be as follows: Femur, 6.6 per cent. of its length; tibia, 5.4 per cent. of its length; foot, 5 per cent. of its

length. Thus, that in the femur is but a fraction greater than that in the tibia; and when we consider the relative rate of growth, it will be seen that the amount of loss in growth is almost, if not quite. equal, since the natural increase by growth of the femur is the greatest occurring in the body. Comparing it with that in the rest of the limb we find that the femur is nearly seven-fold; tibia is nearly four-and-a-half-fold; foot is about three-fold (length). Before the third year the length of the lower extremity is doubled, quadrupled before puberty, and increased five-fold by maturity. This difference in the loss by growth there is seen to be in the same relation as the rapidity of growth. Thus, the greater loss in the femur is in proportion to its greater normal development, and, compared with that in the other parts of the limb, makes the whole nearly, if not quite, equal. Turning to the soft parts, the observations were made by measurements of the thigh and calf at the same points. It was found that the loss in the thigh amounted to 1 per cent. of the volume as determined by measurement, and in the calf of 0.89 per cent. of the volume. This very close resemblance scarcely needs comment other than calling attention to it.

The result of these measurements, showing, as they do, a uniform distribution of the loss of growth, points to the one conclusion—that it is the result of the lack of use which is occasioned by the necessary fixation of the limb. To show that there is a relation between the amount of this shortening and the degree of confinement of the limb, I have grouped a number of cases which were treated by the Thomas splint. These were under treatment for practically the same length of time, and were, in average, of the same class of cases as the preceding. The difference in length varied between one and a half and four and a half inches, with an average of 7.3 per cent. of the length of the sound limb. The volume of the thigh showed a loss of 23 per cent., and of the calf of 17 per cent. of the sound side.

Our facts are, then, the following:

In all joint diseases there is a muscular atrophy occurring early in the disease and persisting throughout its course. The degree of this is not in proportion to the severity of the disease or its duration, but it is determined chiefly by the amount of use permitted or possible to the limb.

That this same atrophy occurs under other conditions which impair the use of the limb, but not occasioned by disease. The atrophy is of the whole leg, being nearly uniformly distributed.

During the period of growth the loss of development extends to the whole leg, and bears a relation to the degree of its confinement.

And from these facts the following conclusions are drawn: That the influence of the disease itself on the occurrence of this atrophy and impaired development is, of itself, slight, but is the result of the lack of nutrition. That this is the physiological result of the impaired use of the limb, which, in the early stages, is the result of the restriction of either the voluntary or involuntary action, showing itself in the general muscular wasting, and later in the loss in development from the enforced rest, and which is seen in the smaller size of the whole limb. The bearing of this on the treatment of chronic joint disease is evidently important. Perfect fixation, as nearly as possible, is essential during certain periods in the course of the disease, but during a large portion, movements and some use of the muscles are without harm, and this is particularly true of the long period of convalescence, when the activity of the disease has subsided, but actual use of the limb is not permissible.

If, during this stage, we can allow, without harm, sufficient motion to the limb to stimulate physiological nutrition, and supplement this by artificial stimulus of nutrition, as by bathing, massage, and electricity, we can obviate to a great extent the loss of growth which impairs the usefulness of the limb in these cured cases.

DISCUSSION.

Dr. Benjamin Lee, of Philadelphia, wished to call attention to the fact that if atrophy, and especially loss of development of the limb in joint disease, were dependent on want of use, as the author seemed to have shown, if we could allow a certain amount of motion in the joint before the inflammation had entirely ceased we should, to that extent, avoid this disproportionate length of the limbs.

Dr. A. J. Steele, of St. Louis, said that before hearing this admirable paper he had supposed that this wasting was due to nerve

reflex irritation, but the author had presented cogent arguments to show that this wasting was due to non-use.

Dr. Cook, of Hartford, called attention to the atrophy of the foot, in support of Dr. Brackett's argument. This is often well marked, and can only be the atrophy of disuse.

Dr. J. K. Young, of Philadelphia, thought that this was such an important paper that it should not be allowed to pass without a full discussion. The view here expressed, of atrophy in joint disease being the result of disuse, is diametrically opposed to the views held by all systematic writers on orthopedic surgery. He had been taught, and still held, that the atrophy which occurs in joint disease results from tetanoid spasm of the muscles reflexly from the joint irritation. In confirmation of this is the fact that, in hip disease, for example, the atrophy appears first in the thigh muscles, and particularly in the adductors, and the calf muscles do not participate in this atrophy. Later, as the atrophy of disuse advances, the calf muscles of the affected limb become atrophied.

A NEW TRACTION BRACE.

By WILLIAM E. WIRT, M.D.,
CLEVELAND, O.

Mr. President: I present for the consideration of this Association a traction brace unique in design and effective in its application.

The mechanical elements involved are, according to authorities on mechanism, the ratchet and lever; and it is in principle somewhat similar to the levers of Lagarousse, with the difference that here we have the force in the lever transformed into rectilinear motion, while in the usual form of ratchet and lever the force is transformed into circular motion.

The brace was designed by Dr. Karl H. von Klein, of Cleveland, Ohio, recently of Dayton, O.

Dr. von Klein, being a specialist on respiratory diseases, has little use for such a brace; but formerly, when in general practice, being of an inventive turn of mind, he devised this model and afterward made use of the principles involved in braces made under his direction. The brace has never been shown to any body of medical men, and as it will be of more especial use to orthopedic surgery than to any other department of medicine, he requested me to present it to this Association, which I take pleasure in doing.

The especial points that I wish to call your attention to in the method of traction used in this brace are:

1. That you do not have to use a key. We all know how annoying it is to look for the lost key. It also does away with the screw-driver, buckle strap, wrench, etc.

2. It is easy to adjust and regulate, and may even be manipulated by the patient or his friend.

3. It is not bulky or bunglesome, and has a fine grade of adjustment.

This traction movement may be used in all forms of braces where traction is desired.

I would suggest its use in hip braces and in knee braces where traction is needed. It could be nicely adjusted to club-foot and lateral curvature braces.

I heartily recommend this method of traction to the careful consideration of the profession.

DISCUSSION.

Dr. R. H. Sayre said that he had seen the same mechanical principle applied in Allen's snare for removing nasal polypi. The method of traction shown in the model just presented appeared to give accurate adjustment in the direction of extension, but the means employed for slackening the traction, he thought, would be liable to cause an unpleasant jar to the patient.

HIP-JOINT DISEASE AND ITS TREATMENT WITH SOME NEW LATERAL TRACTION SPLINTS.

By A. M. PHELPS, M.D.,
NEW YORK.

The profession of America is somewhat divided upon the subject of the treatment of hip-joint disease, and for the purpose of adding, if possible, a few facts to our knowledge of the subject, I present this paper to-day.

1. I will state that I believe that muscular spasm is always present in morbus coxarius.

2. That spasm of the muscle produces great intra-articular pressure.

3. That the articular pressure produced by the spasm of the muscle is a very serious element in producing the destructive changes that are so frequently and so generally seen in joints untreated or badly managed.

4. I also believe that, so far as possible, *absolute immobilization of an inflamed joint until it is perfectly cured should be insisted upon, and that voluntary or passive motion should be most emphatically prohibited.*

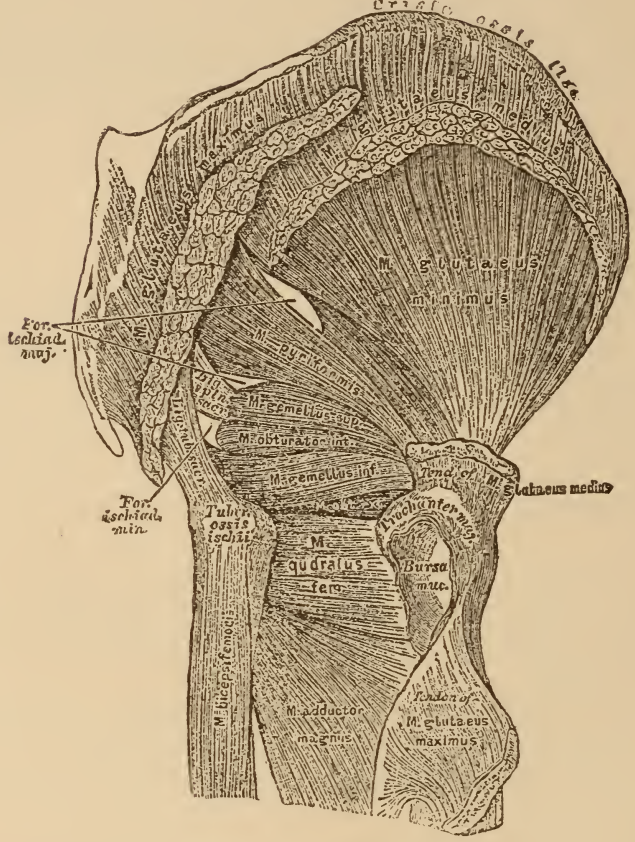
If these ideas are correct, clearly one of the most important steps to be taken in the management of hip disease is to control the spasm of the powerful muscles operating upon the joint by means of extension and fixation applied so as to antagonize the contracting muscles, and put the joint at rest.

It will be observed in Fig. 1 that the great adductor muscles pass obliquely across the body from the pelvis to the femur.

In Fig. 2 it will be seen that the great glutei muscles, the abductors of the thigh, also pass from the pelvis to the great trochanter obliquely. The rotators take the same direction. These muscles

are affected by spasm in hip-joint disease, and they make traction in the line of the neck and shaft of the femur.

Fig. 1.



To control the spasm of these muscles and to relieve intra-articular pressure, lateral traction must be made in a line corresponding to the axis of the neck.

The flexor muscles of the thigh should be controlled by longitudinal traction, and the entire joint fixed. This will be explained later.

How long should the joint be fixed? Until it is perfectly cured. The fear of ankylosis has tended to deter the profession from adopting prolonged fixation of joints inflamed. Hence the devising of

the long traction splint which admits of free motion of the joint. It was born of the fear of ankylosis on one hand and the desire to give the patient exercise on the other. It is still extensively used by eminent members of the profession, notwithstanding those who

FIG. 2.

use it, as many of us have, know that the vast majority of the cases so treated result in ankylosis, shortening, and almost without exception angular deformity. It is not my purpose to denounce the brilliant advance in treatment which marked the advent of the long traction splint over the older methods in vogue at the time of its invention, but only to call attention to its defects, and, if possible, to

point the way to other methods which I hope may overcome the errors of the past.

The belief that motion stimulates the inflamed joint to healthy action by increasing the circulation, and also the fear of ankylosis, has led others equally as eminent to employ passive motion throughout the course of the disease.

To determine the question whether prolonged fixation of the healthy joint would result in ankylosis, with Prof. W. Gilman Thompson I performed a series of experiments in the Loomis laboratory upon dogs. Four dogs were selected and their legs immobilized; the joints were examined at the end of the sixth week and at the end of five months. At the end of six weeks one dog had been killed whose leg had been placed in a cramped position, so as to produce great intra-articular pressure. In this case, upon opening the joint a dark-red spot was found upon the head of the bone which corresponded to a similar one in the acetabulum marking the point of contact between the head and the socket.

There was also congestion of the entire head of the bone and the ligamentum teres closely resembling the congestive stage of inflammation.

The synovial membrane was normal; a section was made of the head of the femur, which divided it into halves. Underneath the articular cartilage, and extending to a considerable depth into the head of the bone, the cancellated structure was deeply congested and filled with coagulated blood. The other dogs were killed at the end of three and five months, and the joints were found to be normal.

The conclusions at which we arrived from these experiments were:

1. That a normal joint will not become ankylosed by simply immobilizing for it five months.

2. That motion is not necessary to preserve the normal histological character of a joint.

3. That when a healthy joint becomes ankylosed or its normal histological character changed, it is not due to prolonged rest, but to pathological causes.

4. That immobilizing a joint in such a manner as to produce and continue intra-articular pressure will result in destruction of the head of the bone and socket against which it presses, as is evidenced by the specimen secured in one of the cases.

5. That atrophy of the muscles of the limb will follow prolonged immobilization of the joint.

If these experiments prove that prolonged fixation will not produce ankylosis of a normal joint, that motion is not necessary for the preservation of its normal function, then the causes of ankylosis must depend upon the pathological conditions and not upon prolonged fixation.

It is claimed that motion in the treatment of inflamed joints prevents ankylosis. This must be a mistake, because the statistics of joints so treated show that ankylosis and deformity to a greater or less extent are by far the most frequent result.

The statistics published by Shaffer and Lovette in the *New York Medical Journal* show in thirty-nine cases finally reported upon in the series:

Ankylosis	19
Slight motion	6
	25
Motion from 10 degrees to 44 degrees	7
Motion to right angle	3
Motion free	3

The three with free motion were treated during the first stage of the disease. Two were under three years old. There were only two cases without shortening.

The splint used was the long traction splint, which admits of free motion at the hip-joint. To test this question still further, I sent a patient whom I had nearly cured, with knee-joint disease, to a distinguished masseur for treatment by that method. I had perfectly fixed her joint for one year. The apparatus was removed and she had motion to about 35 degrees; no pain; could walk with ease. She was daily attended by the masseur. Her leg was flexed and systematically moved and rubbed. After six months I found almost complete ankylosis. A recent examination determined fibrous ankylosis and only a slight degree of motion.

The so-called "ossified man" paid a masseur to move his inflamed joints during two years of his early joint trouble. The result was perfect bony ankylosis of all the joints which were inflamed.

The fakirs of India, after twenty years of penance, holding their limbs in one position, quickly regain the normal use of their joints after their religious frenzy has passed. (Thomas.)

Fig. 3.

Taken from the photograph of a child suffering from hip-joint disease, whose joint had been immobilized in a plaster-of-Paris portable bed for sixteen months. The case was perfectly cured with perfect motion, notwithstanding that aspiration of a quantity of pus from the joint was necessary.

I have several cases of children suffering from joint disease that have been immobilized in a portable bed ten, twelve, and eighteen months, the joints of the lower extremities being kept perfectly quiet during the time. Recent examinations demonstrated that ankylosis had not taken place in the normal joints, while the inflamed joints are freely movable.

I desire to place these cases on record, to stand by the side of the reported cases of ankylosis, supposed to be due to prolonged rest of joint.

In the treatment of wounds, inflamed organs and tissues, rest is one of the most important surgical laws. The surgeon protects the wound from friction by means of proper dressings, and the ophthalmologist puts the inflamed iris at rest by the use of atropine in a dark room. Since rest is a surgical law in the treatment of inflamed tissues in other parts of the body, and motion is not necessary for the normal preservation of a joint (nor can it in any way prevent ankylosis of an inflamed joint), I believe that we should not make an inflamed joint an exception to a well-established surgical law.

The question of ankylosis is determined by the severity, the character, and the duration of the inflammation, the presence of intra-articular pressure, the subsequent cicatricial contraction of soft parts around the joints, the tissues involved, and the amount of destruction of bone and cartilage. Motion of an inflamed joint only interferes with repair, and more certainly hastens on the case to ankylosis and deformity. To prevent this calamity, when it is possible, absolute rest and the relief of intra-articular pressure should be the plan of treatment. Inflamed joints treated upon this plan furnish by far the fewest cases of ankylosis, limited motion, and deformity.

Let us now consider the mechanical treatment. Nearly all cases of hip-joint disease during the period of deformity and the acute and primary stage of the disease, I believe are better treated in bed than elsewhere, for the reason that in bed the joints can be more perfectly immobilized. Here we can apply extension uninterruptedly, and at the same time fix the joint by holding the limb and body in a fixed position. No one would think for a moment of adjusting a walk-

ing splint to the fractured limb of a child, or even allow the child to go about on crutches with a splint. Still this practice is almost universally resorted to in hip disease—a disease much more menacing to life and limb than a simple fracture of the femur.

At the Post-Graduate School and Hospital we usually put our patients to bed, varying in time from three weeks to three or four months, until the deformity is entirely overcome and the more active stage of the disease somewhat ameliorated.

Fig. 4, taken from a photograph, shows a patient with the bed dressings adjusted. A long splint is put on the well limb, and the leg and body to the axilla enveloped with a plaster-of-Paris bandage.

Adhesive plasters are applied to the limb; extension and traction are made in the line of the deformity and at right angles to that line. From six to ten pounds longitudinal traction, and from one to three pounds lateral traction are applied for the purpose of overcoming the spasm of the adductor and abductor muscles.

Children under three and a half years of age are treated with a plaster-of-Paris portable bed. (See Figs. 5, 6, and 7). Others are put upon crutches with a high shoe and a lateral traction fixture splint adjusted.

The bed-treatment, as described, relieves pain, overcomes deformity and the symptoms subside. This suggests the perfection of mechanics. If the principle could be continued, and the patient allowed to exercise, the perfection of mechanical treatment would be attained. To accomplish this I devised the fixation lateral traction splints.

To make the bed, place the child on a piece of paper; mark around him, with the limbs somewhat spread. Put this piece of paper on a board half an inch in thickness, and cut the board to fit the person. Upholster the board with cotton batting, and cover with cotton cloth. A piece of rubber cloth is placed across the portable bed.

The child is laid on the board and enveloped with the plaster-of-Paris bandage from the foot to the axilla to the thickness of half an inch. When the plaster becomes set the front is cut away. The child is now removed: the bed is trimmed by pasting flannel or rubber adhesive plaster over the plaster-of-Paris. Fig. 6 is a correct representation of the bed after it is completed.

Fig. 4.

FIG. 5.

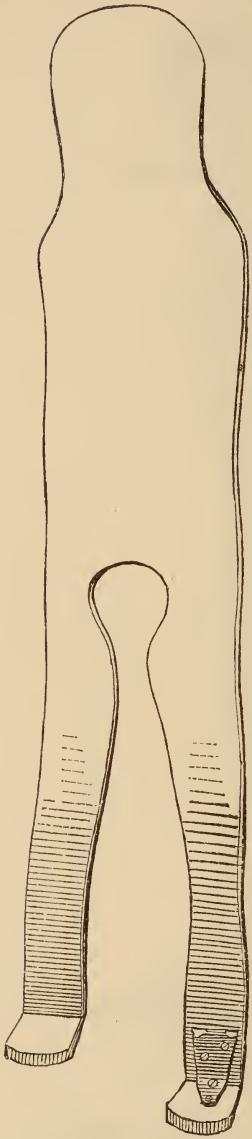


FIG. 6.

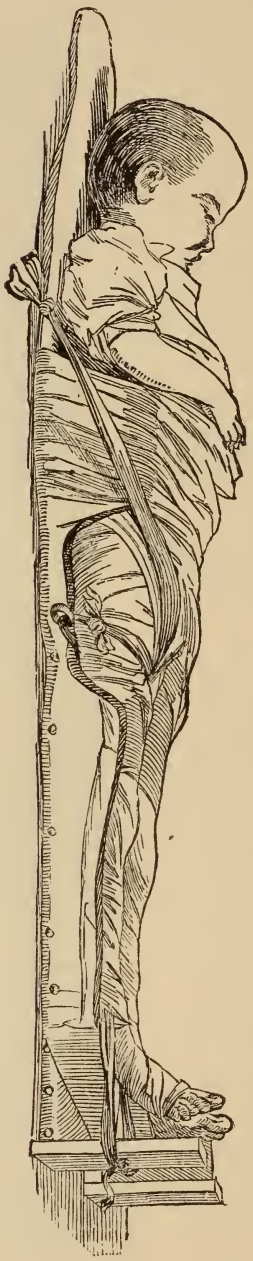
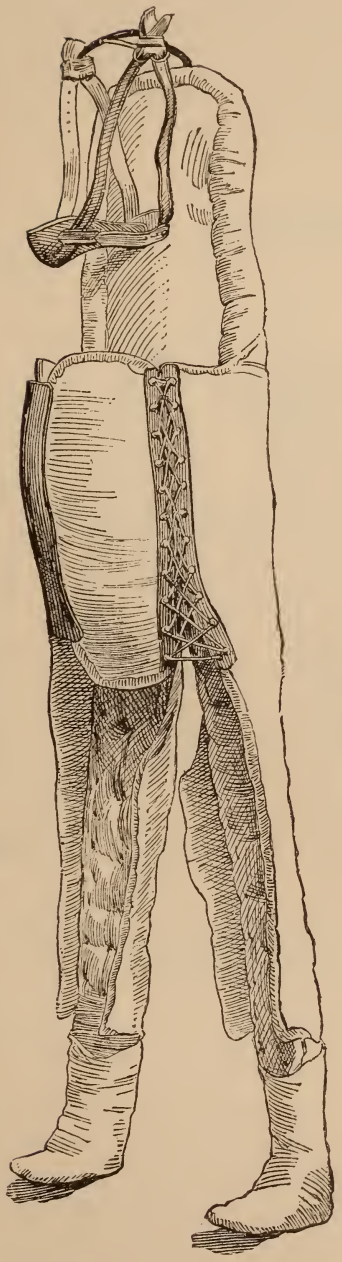


Fig. 7.



The child is placed on this and bandaged in. Extension is made to the foot-piece of the bed, and lateral traction is made by means of the bandage passed around the leg and tied to the side. Figs. 8, 9, 10, 11, 12, 13, and 14 are photographs of the lateral traction splints, double and single.

Fig. 8.

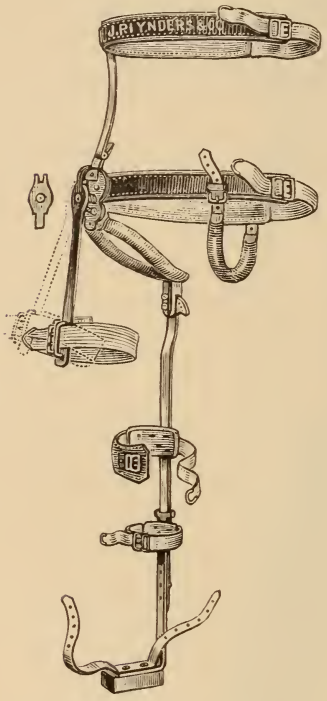
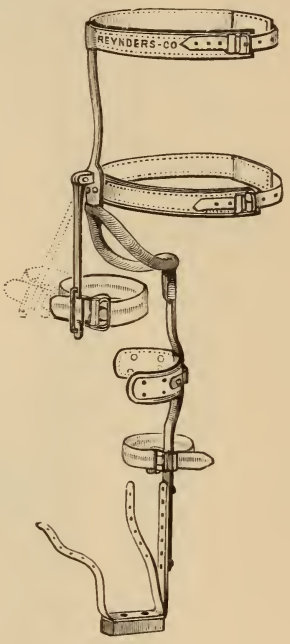


Fig. 9.



The splint extends from the sole of the foot to the axilla, made either with an inside bar (Figs. 8 and 9), or with an outside bar (Fig. 11).

Instead of a strap passing around the perineum, a steel ring is substituted, which catches the patient at the tuberosity of the ischium and does not press upon the muscles.

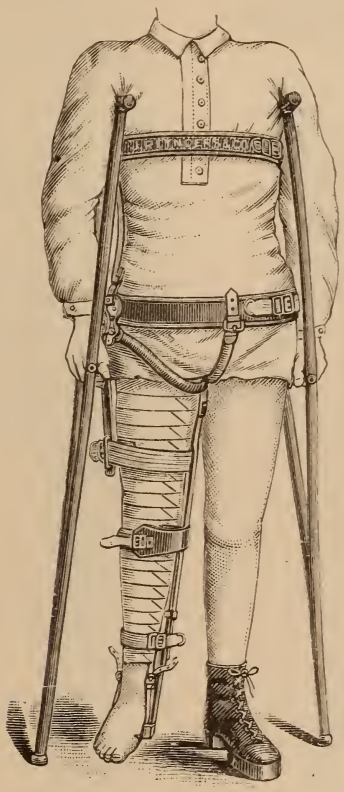
Lateral traction is made in the one splint by means of the lateral traction lever (Figs. 8 and 9), and in the other splint by means of a strap tied to the side bar (Fig. 11); longitudinal traction is made as in the ordinary traction splint, buckling the adhesive strap to the straps at the foot of the splint. This splint immobilizes the

hip-joint, prevents the possibility of angular deformity, and applies traction so as to overcome spasm of the muscles.

The patient is never allowed to step upon this splint.

Splints to immobilize the joint must extend above and below the joint. The long traction splint, stopping at the joint, does not im-

Fig. 10.



mobilize it and the patient injures the joint by stepping upon it, as is evidenced by the almost constant increase in the deformity, as the splint is worn, in a considerable percentage of all cases.

It has been stated that patients wearing the splint extending up on to the thorax cannot sit down. This is certainly incorrect, as all of these patients can sit on the side of a chair, with the diseased limb hanging over the side, very comfortably.

The crutches are an inconvenience; the long splint passing up on to the body is an inconvenience, but the patient had better submit for a year or two to this slight inconvenience than to go through life with a deformed limb.

Fig. 11.

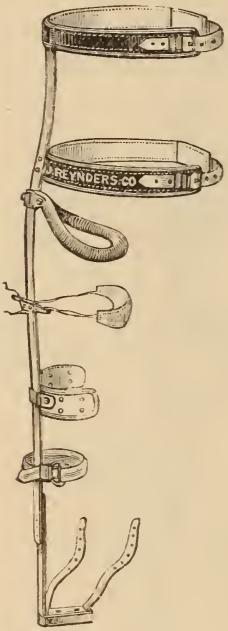
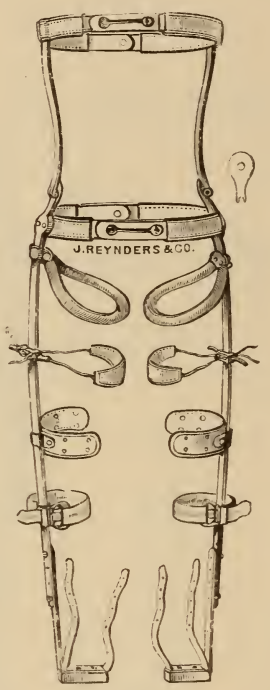


Fig. 12.



The Thomas splint, like the long traction, only tells half the story. He believed that the best result to be attained in hip-joint disease was ankylosis. Believing that prolonged rest would result in ankylosis and that fixation of the hip-joint could only be accomplished by grasping the body above and below the joint (which is a fact), he devised the splint which bears his name. This splint extends from the axilla to the calf posteriorly. His patients did recover without angular deformity, but nearly all had shortening, many to a great extent, and abscesses occurred with astonishing frequency.

A large number of cases presented at the British Medical Associa-

Fig. 13.

Fig. 14.

tion by Mr. Sidney Jones, showed that motion was present in nearly every case.

Thomas's splint, not controlling muscular spasm, allows of great intra-articular pressure, resulting in destruction of the joint and the formation of abscesses.

Another serious objection to the Thomas splint is that the patient will step upon the foot. The splint, ending as it does at the calf, protects the limb only so far as the normal movements are concerned. If the splint extended below the foot, and the patient then attempted to step upon it, and if there were a perineal strap, he could not do so much damage to the joint.

My Results.—Cases received before the development of abscesses rarely develop them.

Cases of small abscesses and effusions into the joint are frequently absorbed or heal by primary union after operation.

Cases of discharging sinuses rapidly cease discharging unless there is extensive bone disease.

Many cases recover with perfect motion.

All cases recover with but slight or no angular deformity.

Shortening of the limb does not increase, and cases of ankylosis I seldom see.

To conclude: My observations lead me to believe that one of the most serious elements of destruction in hip-joint disease is the trauma and pressure produced by the spasm of the muscle; that fixation of the joint without extension is an impossibility; that the successful treatment of the joint must depend upon its absolute immobilization, which can only be produced by proper extension and fixation; that the constitutional treatment of hip-joint disease amounts to but little, independent of mechanical treatment; that mechanics is everything; *that extension in the line of the axis of the shaft and deformity alone, in hip-joint disease, is entirely wrong;* that extension should be made *in a line parallel to the axis of the neck*—in other words, *two lines of extension*—otherwise the idea of extension is not perfectly carried out; that ankylosis of the joint is not produced by immobilization, but by the severity and character of the inflammation; that the long traction hip-splints in general use neither properly extend nor immobilize the joint; that intra-articular pressure results in the destruction of the joint or ankylosis in a large per-

centage of cases, is proved by statistics; that the results in hip-joint disease should be as good as those in knee-joint disease, and will be, provided perfect immobilization can be carried out; that patients should never be allowed to step upon any portative apparatus; that a high shoe on the well leg and crutches should be insisted upon until the patient is cured; finally, *that the angular deformity seen in cured cases should not occur, and such cases are a standing rebuke to the splint and methods employed. In other words, no patient with hip-joint disease need ever recover with angular deformity.* In exceptional cases a slight amount of deformity had better be left than resort to osteotomy or extensive myotomy.

DISCUSSION.

Dr. Arthur Gillette, of St. Paul, thought that he had obtained just as good and equally quick results in the treatment of hip-joint disease in the third stage by the long traction splint, as had been obtained in the cases reported. He did not, however, advocate the use of this splint, as he had recently secured surprisingly great relief in the course of a few months by the use of the Thomas splint.

Dr. Vance believed that the results obtained in the treatment of hip-joint disease depend as much upon the constitutional condition and the surroundings of the patient as upon the splint employed. He had always made use of a simple fixation at the hip, but he was sure that much of his success was due to the superior surroundings of his patients compared with those in large cities, from which most of the statistics are gathered.

Dr. Shaffer could not see the advantages of this combined traction and fixation splint, and his faith was still unshaken in the long Taylor traction splint, modified to meet the indications as applied to the question of immobilization. This splint produces ample fixation, and the perineal pad, when properly applied, does not exert injurious pressure upon the adductor muscles, as was stated in the paper. The author must be willing to wait six years before reporting

his results, and even then it is not certain that relapses will not occur. One case which he had seen had been discharged cured fifteen years before and had had pretty good motion during this time, and yet it relapsed. The apparatus combining the Thomas and Taylor traction, he thought, had been originally presented to the Association by Dr. Lovett, of Boston.

Dr. Ridlon wished to state once more that the splint of Dr. Phelps and the one shown by Dr. Lovett three years ago were made on essentially different principles from the Thomas splint. The object of the Thomas splint is to secure immobilization by posterior leverage, and its action is identical with that of the Taylor spinal splint, while these splints of Drs. Phelps and Lovett avoid all leverage and give immobilization by traction.

Dr. A. J. Steele approved of Dr. Phelps's method, combining as it does the English method of rest with the American one of traction.

Dr. Henry Ling Taylor was glad to be able to approve of much of the paper, and especially of the points upon which the author had laid the greatest stress, as these had been well inculcated into him ever since his youth. His father had almost from the beginning insisted upon rest in bed with traction during the stage of acute inflammation, after which the patient was provided with a splint to enable him to go about and secure the benefit of fresh air; he had also taught that the better the immobilization in the acute stage of joint disease, the better the motion ultimately obtained.

Dr. R. H. Sayre, of New York, thought that the vast majority of cases did not require lateral traction, as the patient was relieved of pain and recovered with fair motion without the employment of this measure. During the acute stage rest was best secured by recumbency and traction; but later on, when the inflammation had ceased, leaving a condition of fibrous ankylosis, much benefit will accrue from the *judicious* use of passive motion. If the pain and tenderness after passive motion last for more than twenty-four hours it is an indication that the passive motion has not been judiciously

employed. It is a mistake to suppose that the patient's own efforts are sufficient to break up ankylosis. For over a year he had had a stiff finger as the result of a dissection wound, and efforts at voluntary motion were of no avail until a certain range of motion had first been secured by passive motion, and then he was able to voluntarily increase the amount of mobility of the joint. He was sure his own unaided efforts would not have resulted in motion. The case of third-stage disease reported certainly was an excellent result, but the speaker had seen quite as good ones follow the use of his father's old short splint with traction. The splint exhibited was a most excellent one, but for the majority of cases it was unnecessarily cumbersome.

Dr. E. M. Moore, of Rochester, had been surprised at the statements made concerning the inadvisability of moving a joint which is only *moderately* inflamed. A joint was made to be used, and when not used, it generally cries out against the malpractice of enforced rest. He had been in the habit of employing traction, and of allowing a certain amount of motion. The instincts of childhood should always be heeded, and in this matter of allowing motion after the acute stage has passed, children may teach us a useful lesson.

Dr. Benjamin Lee, of Philadelphia, thought the simile between the inflamed eye and the inflamed joint was a most unfortunate one, for the ophthalmologists of to-day do not use the dark-room nearly as much as formerly, and at present massage is a favorite method of treatment for an inflamed eye. The bonesetters were undoubtedly an ignorant class, but it is well known that many cases of bone disease which had been abandoned by surgeons have been cured by these men. Massage applied to a limb at some distance from a diseased joint will stimulate the absorption of the products of inflammation, and after awhile the joint itself will become extremely tolerant of such manipulation. Motion may, in this way, be restored in the same number of weeks as the unaided efforts of the patient would have required months to obtain.

Dr. Shaffer said that in a recent conversation at Colorado Springs with Dr. Solly, that gentleman took the ground that some

of his best results were obtained in cases in which the tubercular masses were subjected to increased expansion of the lungs at a high altitude, and he thought better results in hip-joint disease would be obtained if such patients were given more liberty and motion. While he did not indorse this view, it was interesting as being the opinion of an eminent climatologist.

Dr. Phelps, in closing the discussion, said that his brace differed from Dr. Lovett's in having an arrangement for lateral traction. It was a fixation splint. All our text-books teach us that prolonged fixation produces ankylosis. And this is the reason probably why Dr. Moore was so anxious to secure motion of the joint. He had, however, previously submitted the results of his experiments in this direction, which distinctly disprove such teaching, and he was pleased to see that those conclusions were steadily gaining ground. He could not see why if lateral traction were useful at all, it should not be invariably employed, nor could he understand what was to be gained by motion of an inflamed joint. Dr. Lee's remarks on massage were worthy of careful consideration; but Dr. Lee misunderstood him. He had said an inflamed iris, not eye, and the plan of treatment was rest in a dark room with atropine.

THE ASPIRATOR IN ORTHOPEDIC PRACTICE.

By AP MORGAN VANCE, M.D.,
LOUISVILLE, KY.

THE use of the aspirator by the orthopedist is very much neglected, according to my observation.

In the treatment of cold abscesses one will follow the old aphorism in pathology, "The longer a cold abscess remains unopened the better it is for the patient;" another will incise it so soon as discovered; while the third will open, irrigate and endeavor to treat it antiseptically. I wish to recall a treatment which lies between the extremes and offers more, I think, than either, as it makes either of the above methods possible later in the case, with a great probability that the abscess will be cured without ever being opened except with the needle.

I began some ten years ago the systematic aspiration of all cold abscesses with the sole idea of keeping them within bounds, so that when an opening was made, less constitutional disturbance would result, because there would be in consequence of the frequent emptying much less area to be infected.

This was before the antiseptic treatment had been proposed.

I soon found that quite a proportion of the cases were cured, and ever since I have practised it with a view of getting rid entirely of the condition without opening. I think that three out of five cases of spinal or hip abscesses can be cured by repeated aspiration; even in those cases where the abscess opens, the outcome is much better because of the frequent emptying. The area possible to be infected is kept at a minimum and the pressure exerted is much lessened.

I have never used the additional treatment of the injection of iodoformized oil. The aspiration should be repeated as often as any fluid can be found, and as early as possible after the diagnosis is

made—while the sac still is sub-fascial. After the second or third aspiration the material becomes more serous, and in several instances clear serum has at last been drawn off. Firm pressure is made over the part after each tapping, and the mechanical treatment of the condition causing the abscess is carefully looked to.

It sometimes happens that the contents become caseous and will not pass through the largest needle; usually this occurs in old accumulations. In two or three instances in which I have failed to empty the sacs from the above cause, the abscess has completely disappeared without further treatment, part of the contents having been removed in each case before the needle becomes clogged. How to explain this I do not know. Ordinarily they have to be incised and cleaned out.

The aspiration can be done without general anæsthesia, and even the slight pain from the injection of cocaine can be prevented by the use of a little salt and ice at the point of puncture. I have used simple aspiration in other conditions which we meet as specialists, with gratifying results. In all accumulations of fluids in synovial sacs, particularly of the knee, not only in subacute and chronic, but in acute inflammation, I have seen much relief come and a more rapid cure result.

My experience teaches me that few surgeons make any distinction between a cold abscess and other abscesses which contain true pus the result of external infection. We are now aware that these abscesses—the result of chronic bone disease, and sometimes occurring without this condition—do not contain real pus until they are infected from the air; hence there is greater danger in opening them, and a consequent need for some treatment where this is not necessary.

A STUDY OF ATROPHY.

By ROSWELL PARK, M.D.,
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I WISH to invite your attention to an historical review of certain characteristics presented by that diminution of volume or mass of an organ or part that is described in one word, *atrophy;* and perhaps less to its pathological than to its clinical side. Strictly speaking, there is a great difference between arrest of growth and atrophy in the true pathological sense of the word, and yet, as surgeons see these cases, there is at times so little apparent difference between the respective results of the two processes that we make very little clinical distinction between them. At all events, without dealing just now with minute differences, let us see what of interest a discussion of coarser features may bring out. I wish here to acknowledge no small indebtedness in this connection to a work published in 1882 by Mondan, entitled *Recherches Expérimentales et Cliniques sur les Atrophies des Membres*, which emanated from the Lyons school, and which is based largely on observations made in the clinic of Ollier, than whom no more accurate observer of such matters is known. It is a brochure little known or read, at least in this country, but it will amply repay perusal.

In Petit's *Traité des Maladies des Os*, ii. 23, we find some interesting notions concerning muscular atrophy after fractures, expressed thus: "Atrophy or diminution is an accident which supervenes, not at the beginning, but later, by enfeeblement of nerves and arteries which continue to be compressed, either by exuberant callus or by too tight bandaging. These obstacles to free circulation may cause lack of nutrition or atrophy." In 1776 John Hunter put forth his theory, according to which sympathy figured largely in the process, and in which may be found the germ of the idea of atrophy by reflex action. In 1835 Nélaton insisted upon the importance of atrophy

of the thigh among the signs of hip-joint disease. He stated that the arrest of development of osseous tissue was proportional to atrophy of soft parts, and that this was a rule to which there were very few exceptions. It is also observed, he stated, not only in spontaneous luxations, but in all those diseases that condemn a limb to prolonged rest. Thus he cited atrophy of the femur in the case of a necrosis of the pelvis. These ideas are elaborated in his great work (*Path. Chir.*, 1847, ii. 264).

In 1837 Curling published his "Remarks on Certain Forms of Atrophy of Bone" (*Med.-Chir. Trans.*, 1837, p. 336), in which he described a *concentric* and an *excentric* atrophy of bone. The former depends mainly on local causes, such as consecutive dislocations, caries, inflammations resulting from gunshot fractures, etc. He included here the bone in an amputation-stump, as well as the atrophy of ankylosed limbs. He speaks of *functional inertia*, and the influence of the central nervous system by which, in paralytics, healing of fractures is delayed. He shows how compression of the main artery supplying such organs as the liver, spleen, or kidneys, will lead to their diminution, and he considers at some length the atrophy of a bone-fragment broken from a main portion which contains the principal nutrient artery. The nutritive supply in such cases cannot be maintained, owing to the inextensibility of the Haversian canals; consequently the fragment slowly disappears. Under the head of excentric atrophy he deals mainly with osteomalacia, which is a generalized process depending upon a constitutional condition.

Bonnet was alive to the importance of atrophic processes, and in his *Traité des Mal. des Articulations*, 1845, i. 217, he wrote: "Whatever the varieties which they present, according to anatomical conditions, chronic inflammations of the synovialis consecutive to mechanical injury engender always an atrophy, more or less marked, of the surrounding parts." In general this will be noted about the injured joint, but sometimes it extends further, and may affect an entire limb. But Bonnet was, perhaps, not the first, certainly not the only one of his day, to allude to atrophy as a significant accompaniment of chronic joint-disease. Malgaigne (*Anatomie Chirurgicale*, i. 166) directed attention to disappearance of the alveolar process when deprived of its teeth, to thinning of the cranial bones

after trephining, and to atrophy of the ilium and femur after old and unreduced dislocations of the hip. Even for Malgaigne functional inactivity was the cause of diminished nutrition.

In 1845 Roux put forth certain noteworthy views (*Annales de la Chirurgie*, xv.), especially with reference to atrophy of the deltoid in arthritis of the shoulder. For him the stretching of the muscle over a capsule distended with fluid was the sole and sufficient cause; an analogous condition occurring also at the knee.

Denonvilliers, in 1853, presented to the Société de Chirurgie a boy of seventeen, whose right arm had been amputated ten years previously. At the time when he was exhibited there was a protruding necrotic stump, three centimetres in length. At the same meeting Guersant reported a similar case. He asked whether this was not due to a physiological elongation of the bone rather than to any fault in the operative technique. (*Bull. de la Soc. de la Chir.*, iii. 430.)

In 1858 took place another interesting discussion in the same society concerning the growth of amputation-stumps. (*Bull. de la Soc. de la Chir.*, ix. 450.)

Seeking a cause for this fact that in young subjects the bone frequently grows through the soft parts of the stump so as to perforate them, Marjolin attributed the longitudinal growth of the bone to "a certain degree of ostitis propagated from the upper epiphysis." This explanation, accepted by Broca, was denied by Chassaignac and Richet, who explained the relatively greater growth of the fibula in leg stumps to osteophytes developed at its extremity along with necrosis of the tibial end.

Humphry (*Treatise on the Skeleton*, p. 70) in 1858 called attention to the results of disease of bone. "If a limb be not used, the bones usually waste. . . . These points are well illustrated by the conditions which the bones of stumps present when the limbs have long been amputated. In some the bones are cleared of their cancelli and reduced to a mere porous shell, the size remaining unaltered. In others they become much reduced in circumference, their walls retaining their proper density. In a third class the bones are small, and are also light and porous. In a case recorded by Larrey, of a man who died forty-one years after amputation of the arm near the shoulder, the scapula was as thin as paper, and the

clavicle no thicker than that of an infant. I am *not aware* that a bone is *ever reduced* in length as a consequence of atrophy. If a part be disused by reason of paralysis or other cause, the bones may fail to attain their proper length; but, having attained it, I do not know that they ever lose it."

In 1859 Gosselin and Lejeune published important articles concerning muscular atrophy consequent upon fractures. They claimed that it always occurs in adults, the former reporting a case in which it existed ten years after the fracture. In children it is very much less common. Gosselin ascribed a more important part in producing atrophy under these circumstances to immobilization than to compression by bandage, and says: "The condition cannot be attributed to the surgical apparatus, but depends entirely on the primary affection. (*Gazette Hebdomadaire*, 1859, 130–64.)

Coulon, in 1861 (*Traité des Fractures chez les Enfants*), speaking of fractures in children, says that perhaps "scrofula," that is "scrofula of bone," may, without producing caries, so weaken the osseous tissue by rarefaction as to predispose it to fracture. He says that he had never noticed muscular atrophy in children, perhaps because of the comparatively brief time in which their bones heal; but he fails to recognize that such periods of time are only relative. Referring to experiments made by Baizeau and Herpin concerning elongation of fractured bones, he says that he has not seen sufficient clinical proofs to permit him to acknowledge such a growth. The old subject once more came up before the Société de Chirurgie in 1884 (*Bull. et Mém.*, x. 521), when Kirmisson showed an amputation-stump in a lad of twenty, whose leg had been amputated when he was four years old. At the centre of the stump was a bony projection, divided into two tuberosities by a transverse fissure. One of these belonged to the tibia, the other to the fibula, both having been fused together. Farabœuf, while not rejecting Verneuil's views, suggested that such cases might be explained by a too rapid primary union with insufficient solidity of muscle and soft tissue, and that the condition might be prevented by causing the stump to heal by granulation. All agreed that in children amputation-flaps should be made exceptionally long.

To this peculiar atrophy affecting stumps Verneuil has given the name *physiological conicity*. He describes it (*Mémoires*, ii. 830) as

occurring especially in arm and leg stumps; less often in thigh and forearm, because of lesser activity of the cartilages of the upper ends of the femur, radius, and ulna. He saw a large number of examples while distributing prosthetic apparatus at the Central Bureau of the Parisian Hospitals.

These statements of Verneuil's, if not founded upon the more elaborate explanations of Humphry, at all events corroborate them. It has been shown by Humphry (*Med.-Chir. Trans.*, xliv. 118) that the extension of the shaft takes place most quickly, and is most prolonged at the end where the bone can best bear the weakening consequent on the more rapid changes in the growing matrix; and that is usually the larger end. For instance, the lower end of the femur is larger, and is more favorably circumstanced for bearing weight and resisting muscular force than the upper end; and the ossifying processes are much more active, and are longer continued at the lower end than at the upper. In the tibia the lower end is at a disadvantage in comparison with the upper, in consequence of its smaller size, the greater weight borne by it, and the violent shocks to which it is exposed from its closer proximity to the ground, and there is less growth here than at the upper end. In the upper limb the conditions are in many respects reversed, and growth is, consequently, more active at the upper part of the arm and at the lower part of the forearm.

Numerous other writers have alluded to the same condition. In one of Liston's cases the humerus projected in an extreme degree, and terminated in a hook-like process or exostosis. The latest contribution to the subject is by C. A. Powers (*Med. Record*, June 7, 1890, p. 641), who reports several instances.

But it is to the *Traité de la Régénération des Os* of Prof. Ollier that one turns with the greatest satisfaction for the experimental elucidation of this subject. Thus we find (i. 377) a long chapter upon the influence of irritation or of removal of various parts of bones upon their growth. After having established that the most common cause of hypertrophy of bones is irritation, he studies the causes of arrest of their development and their atrophy. Two factors come into play here: the destruction of tissue which may concern and favor their growth, and gradual failure in the evolution of such tissues. They necessitate a careful study of epiphysis,

diaphysis, and conjugal cartilage, which Ollier has carefully carried out experimentally, and has shown that it is not by a precocious union of epiphyses to shaft that lesions of epiphyseal cartilage produce arrest of growth, but that the initial factor is arrest of proliferation of cartilage-cells. He has, furthermore, fully described the effect of fractures, of epiphyseal separations, of arthritis, and ankylosis in producing retractive tissue-changes. Mutilations of bone almost always produce arrest of development, which yet varies much according to whether the arthrodial or conjugal cartilages, the epiphysis, or the shaft have been most interfered with. Not only in the bone operated on do tissue-changes occur. In the case of the forearm and the leg the parallel bone frequently undergoes alterations; sometimes this is in the direction of increase of thickness—that is, a compensatory hypertrophy—or, when one is pretty firmly fixed to the other, the more rapid growth of one forces it to assume a curve or some change of shape.

I have recently seen such alteration in the lower end of the fibula, apparently produced in the first place by a club-foot, upon the outer side of which the patient (a girl of sixteen) walked. Pressure upon the fibula was thereby removed and a certain tension produced by pull upon the external lateral ligament, while the whole weight was borne by the tibia. The result was that the lower three inches of the fibula assumed the exact shape of the arc of a circle of some ninety degrees.

So, for instance, after resection of the radius and ulna, the humerus, though not operated upon at all, ceases to grow with the same rapidity as does that of the opposite side; and, if the humerus alone has been attacked, the scapula on one side and the radius and ulna on the other are indirectly affected. These alterations are of a peculiar nature, and do not occur immediately; they take place by a gradual transition-state, during which they diminish in volume but increase in length. To this phenomenon, which he has most carefully studied, Ollier has given the distinctive name of *atrophic elongation*.

To the atrophic changes occurring in stumps, also, Ollier has paid great attention. But little has been said or written in this regard. Since the discussion in the Société de Chirurgie in 1858, alluded to, Humphry published two memoirs, and the more recent

researches of Gütebock include nearly all the literature of the subject. Nearly everyone who has dealt with the subject has alluded to the atrophy which is most marked in connection with stumps that are nearly immobile; while the clinical fact was generally recognized, the interpretation remained for Ollier to enunciate. He lays great stress on the effect of *functional inertia*, and has sought to assign its correct position among factors. By observation and by experiment he came to the conclusion that function of a limb was a necessary stimulus to the growth of its skeleton. Suppression of this stimulus leads inevitably to atrophy of the part. This was but a systematic and comprehensive statement of generally recognized facts.

In 1870 Boeckel published an interesting memoir concerning the effects of hip-joint disease in causing atrophy of the lower limb. He formulated these conclusions:

1. That the arrest of growth is proportional to functional inactivity and atrophy of muscles.

2. That the bones are rarefied, and that active treatment, while shortening the course of the disease, acts also to lessen the extent of the atrophy.

3. That pelvic distortion (posture-deformities) tends to produce arrest of growth, exaggeration of the pressure transmitted through the femur, and atrophy of the muscles of the buttock.

4. That shortening affects the superior pelvic strait, but not enough to cause a serious obstacle to parturition (*Archives de Physiologie*, 1870–71, p. 435).

A thesis by Collette, in 1872 (*Thèse de Paris*, No. 182), marked an advance, since not only did he discuss the atrophy which accompanies forms of joint disease, but he called attention to the increase of fatty tissue which often accompanies wasting of other soft parts. More than this, he showed that curious atrophic freaks occur. Thus he cites a case of gonitis with wasting of both upper and lower limbs on that side, with great increase of fatty tissue, a notable enlargement of the breast, and a marked atrophy of the testicle also on that side.

In quoting this case I am reminded of a case of my own, an amputation-stump in a young woman whose thigh I amputated seven years ago, when she was sixteen years old. The stump is

now not conical, though it would be were it not that an overgrowth of adipose tissue makes it measure more in circumference than does the opposite thigh at the same height.

It was in 1873 that Reyher's careful study upon the influence of prolonged immobilization upon the joints appeared (*Deutsche Zeitschrift f. Chir.*, iii. 189). His microscopical studies of the various tissues implicated gave a peculiar value to his work. He never found any inflammatory phenomena, either hyperæmia or tumefaction. Consequently, the atrophic changes of the adult or aged are merely a degeneration not caused by inflammation.

Sabourin, during the same year (*Thèse de Paris*, 1873), introduced a novel theory to account for the atrophies which accompany articular rheumatism, particularly those which one encounters about the shoulder in the deltoid, according to which it was due to irritation of the peri-articular fibrous tissue. To confirm this view, he pointed to the extreme soreness in muscular origins and insertions; in other words, to the extreme tenderness of masses of fibrous tissue in the neighborhood of any rheumatic lesion. Duchenne, in particular, has described an atrophic form of deltoid rheumatism, to which Sabourin quite eagerly applies his explanation.

It was not long before confirmations of Ollier's studies began to appear. Haab, in 1875, published a brochure, in which he corroborated Ollier's views concerning the normal growth of bone, and then he mentions pathological elongation after fractures, ostitis, and arthritis, and gives some of the cases reported by German surgeons. Assigning a secondary rôle to inertia and immobilization, he lays the principal blame upon the epiphyseal cartilage. For sympathetic elongation of the femur it is enough to have an irritation of the tibia sufficiently active and lasting. Failure of pressure upon the joint is a sufficient reason in his estimation, and he proposes to substitute the expression *elongation from lack of pressure*, for Ollier's term, atrophic elongation. Haab fails to comprehend how atrophy can produce elongation. He would account for many of these bone-changes by sympathy between femur and tibia, for instance, so that one is lengthened or shortened when the other is pathologically elongated, all of which, says Mondan, while criticising these expressions, is rather incomprehensible.

During the same year appeared the essay of Güterbock (*Arch.*

für klin. Chir., xvii. 584), in which he attributed the bone atrophy of an amputation-stump to an irritative action, the evidence of which he found in the occasional presence of osteophytes, and of other tissue alterations, such as the subperiosteal development of giant-cells, as described by Rusticzky. He considers these to be the results of functional inactivity in subjects of various ages and conditions. The experiments of Milne-Edwards, published fourteen years previously (*Annal. des Sciences Naturelles*, 1861), may have some bearing in this connection, as they appear to have in the thesis of Teissier (Paris, 1875). If we deprive animals (birds) of food containing calcareous elements, the volume of their bones diminishes, but their composition does not vary. At the end of three months the bones of such animals will weigh a third less than those of one normally nourished, but analysis would show no change.

Fifteen years ago Sir James Paget made these remarks in one of his published clinical lectures (*Lecture IV.*, p. 208), speaking of the wasting of limbs near affected joints: "This wasting occurs quickly in nearly all acute inflammations of joints; more slowly in the chronic inflammations. In the chronic it may be from disuse alone; in the acute it is not so, for it is much more rapid and extensive than in any cases of mere disuse. Compare, for instance, cases of fracture of the thigh with those of acute disease of the hip, and you will see how much greater is the wasting with acute disease than with disuse alone. Rapid wasting may be seen in the whole lower limb, especially in the thigh and the nates, in all acute hip-joint diseases; more slow wasting in the painless scrofulous diseases; less still in the chronic rheumatic. Wasting in the lower part of the anterior and lateral muscles of the thigh is quickly apparent in acute knee-joint disease; only less quickly in the chronic. . . . It is, I repeat, not a mere wasting from disuse; it is far more rapid than that, more like what has been called acute atrophy of muscles, such as may often be seen in the swiftest cases of infantile paralysis. . . . It seems dependent on disordered nervous influence, and often appears proportionate to the coincident pain, as if it were due to the disturbance of some nutritive nervous centre, irritated by the painful state of sensitive nerve-fibres."

Two years later appeared Valtat's excellent thesis (*De l'Atrophie*

musculaire Consécutive aux Maladies des Articulations), which contained the following conclusions:

1. Most joint diseases react energetically upon the nutrition of the muscular system.

2. Very early in such cases one sees a notable atrophy with paresis, more or less accentuated, of certain muscles, particularly those pertaining to the affected joint.

3. This atrophy is not the result of functional inertia, or of inflammation of muscles, nerves, or cord; in all probability it is produced by the same mechanism as the other reflex phenomena.

4. It is a matter of no small importance; it increases usually *pari passu* with the joint lesion, and remains, in the vast majority of cases, after this has recovered.

5. Its duration is commonly long, and it shows no tendency to spontaneous disappearance. Sometimes the muscles recover themselves by exercise, but by no means always.

6. They improve much more rapidly under the use of the continued current, or better still under the combined use of both currents.

The clinical phases of the subject were excellently presented by Berguien (*Thèse de Paris*, 1877) in the same year. His was the first work in which the relations between the development of the bones along with their superimposed muscles were clinically discussed. Studying fifty-nine cases of hip disease he demonstrated that there is always atrophy of the limb in these cases, and that it pertains to the bone as well as to the muscles, especially in very young patients; that the bone-atrophy is most marked about the joint where the effects of pressure would naturally be greatest, and that it is itself due to atrophy of bloodvessels; that deficiency of nutrition can be demonstrated by the thermometer; and that in those rare cases in which atrophy does not appear one may impute the fact to a coxalgia, coming on after the eighth year, when the subjects are very courageous and seek to keep the limb in active service.

In 1877 and 1878 Helferich published memoirs of considerable importance (*Archiv. d. Phys. und d. Anat.*, Mai, 1877, and *Deutsche Zeit. f. Chir.*, 1878, x. 324). He had demonstrated by numerous experiments, and as opposed to the views of Wolff, the exclusive rôle played by the conjugal or epiphyseal cartilages in longitudinal

growth of long bones. This he did by excising them from growing young animals, and noting the failure to grow. In his second paper he studied the disordered relations that exist between necrosis and the coefficient of growth of various bones; he takes up the question of the frequency of inflammation in the different parts of the same bone, and after showing that it is in the vicinity of the cartilages that it occurs most commonly, he finds here the verification of his experimental work.

Passing by a number of brochures in which appeared nothing of great importance, De Clerville republished in 1880 (*Thèse de Paris*) a remarkable case of nearly total disappearance of the humerus, first broken at the age of eighteen, and twice after that. Only the superior and inferior epiphyses were left, and these were represented by small pieces. The patient died at the age of fifty-two, and the muscles of the arm presented a remarkable atrophy and fatty degeneration. Similar cases are of course reported in the work of Béranger-Feraud, but a case of this completeness or intensity is perhaps unique. It must be attributed largely to the influence of repeated irritations upon the vitality of the callus.

Lataste (*Thèse de Paris*, 1881) propounded in 1881 a novel explanation of the muscular atrophy following fractures. For him it depended not on immobilization, or compression, or lesion of nerve-fibres, but upon a certain degree of myositis, which was evidenced by local elevation of temperature.

In 1882 Segond (*Rev. de Chir.*, Août et Sept.) described a diminution in the calibre of the vessels in amputation-stumps or curtailed limbs. This is never consecutive to muscular atrophy, but sometimes precedes, sometimes accompanies it; and it is, according to Segond, a very important contributing factor.

The causes, then, so far as generally ascribed, which lead to atrophy of parts, may be thus rehearsed:

a. Functional inertia.
b. Inequality or defect of nutritive supply.
c. Inflammation.
d. Something in the general condition.
e. Trophic nerve disturbance.

These have been thus arranged by Mondan.

Within the present year Duplay and Cazin have published

(*Archives Générales de Médecine*, January, 1891) the results of certain experimental researches into the nature and origin of muscular atrophies following diseases of joints, stating that of all the various theories advanced to explain atrophy of muscles following joint lesions the "reflex" theory of Vulpian has found the most general acceptance, *i. e.*, changes originating in the irritated terminations of the articular filaments. This theory explains the rapidity of onset and the absence of the reaction of degeneration, either in the cord or in the large nerves. In their researches acute arthritis of the knee was produced by the injection of tincture of iodine or nitrate of silver, or by the actual cautery. In four or five days an appreciable diminution in size of muscles was invariably noticed: in eight or ten days they had become soft, and the atrophy steadily progressed until about the fifteenth day, when it either ceased or progressed much more slowly. The animals were killed at intervals up to the thirtieth day, when the various muscles of the healthy and affected limbs were carefully weighed. The loss of weight amounted in some cases to 50 per cent. Microscopic examination of the nerves of these limbs shows that no lesion is usually present in the large trunks or in the motor filaments, but in articular nerves characteristic changes were constantly present. These changes are partly denenerative and partly inflammatory; they never show signs of spreading upward along the nerve-trunk, and no ascending lesion, such as has been described after amputations, could in any case be discovered, nor were there any alterations in the spinal cord, or nerve-roots, or ganglia.

The authors consequently deduce the following two conclusions: 1. That the muscular wasting following muscular lesions tells of a simple atrophy. 2. That this atrophy can be explained only by reflex action through the spinal cord, produced by the irritation of the terminal filaments of the articular nerve.

This appears to summarize fairly well the valuable literature of the century concerning an important topic. Such special attention as the writer had intended to devote to a further elucidation of Ollier's views on *atrophic elongation*, and a summary of his experimental work, will have to be postponed to another occasion, and made the topic for another communication.

DISCUSSION.

Dr. N. M. Shaffer said that he had been much interested in the study of atrophies, and he had been impressed particularly with those cases in which there was an inequality in both the upper and lower extremities. It would seem as if the two hemispheres of the body, so to speak, had grown under different influences. He had not infrequently seen an isolated bone, like the tibia or fibula, longer than its mate, and the condition was probably attributable to some local interference with nutrition. He had been most interested in those cases of hypertrophy or elongation of the bones of one side of the body. Many cases of lateral curvature of the spine he thought were due not to mere difference in length of the lower extremity, but to the fact that half the body of the vertebra is under a different centre of development from the other half, giving rise to these unilateral differences both of the lower and upper extremities. Most of us would be surprised at the frequency of these differences, if we were accustomed to take systematic measurements of the upper as well as of the lower extremities.

Dr. R. H. Sayre called attention to a remarkable case of atrophic elongation with extraordinary increase in the length of the bones. It was in the museum in Philadelphia, and was called the Kentucky Giant. The bones were so diminished in circumference and elongated as to make this man something over seven feet in height. He also had a moderate lateral curvature.

THE DIAGNOSIS OF POTT'S DISEASE.

By ROBERT W. LOVETT, M.D.,
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In considering the question of the diagnosis of Pott's disease, one must start with the assumption that the *history* is of little or no value in establishing the presence of the disease. It may be significant enough to make one suspect very strongly the existence of vertebral disease, but without definite physical signs it can never be positive enough to justify the diagnosis of Pott's disease. With this understanding, it may be asserted that particularly significant symptoms are paroxysmal pain in the chest or abdomen, which is aggravated by jarring or movement; and pain coming on at night when the child is first falling to sleep (significant as the well-known night-cries, simulating very closely those of hip disease). Other symptoms which should excite suspicion are: tiring easily, leaning on tables and chairs, carrying the chin in the hand, and supporting the weight of the trunk by placing the hands upon the knees. These symptoms should all be considered significant and suggestive, but it may be said once more that they cannot be considered, in the absence of physical signs, as establishing the diagnosis of Pott's disease. Such a history should be allowed especial significance when it occurs in the children of tuberculous parents, or when it follows some months after the exanthemata, or comes on as the remote result of a fall which has injured the spine. It should be mentioned that the absence of pain can in no way be assumed to show the absence of Pott's disease.

The diagnosis, then, must be made wholly from the *physical examination*, and the chief physical signs upon which one must rely can be divided into two classes: (*a*) those occurring from bony destruction, and (*b*) those dependent upon muscular spasm.

(*a*) *Signs Due to Bony Destruction.*

Since these are made evident by the presence of angular deformity of the spine, which is the result of bony destruction, they are so conspicuous that they can scarcely be overlooked. And the prominence of one or more of the vertebral bodies, associated with muscular spasm, is a positive sign of the presence of the disease, unless it is the result of a fracture of the spine, or in adults the outcome of malignant disease. In the larger number of cases, as they come to the surgeon, this bony deformity has occurred, and the diagnosis can be made at a glance; but the most important class of cases, so far as the diagnosis is concerned, are those where bony destruction has not yet begun, and where the need of an early diagnosis is evident, in the hope that it may lead to treatment which may be sufficient to prevent the occurrence of deformity.

(*b*) *Signs Arising from Muscular Spasm.*

These are:

1. Stiffness of the spine in walking and in passive manipulation.
2. Peculiarity of gait and attitudes assumed, according to the location of the disease.
3. Lateral deviation of the spine.
4. High temperature.

Of the latter two it may be said that they do not receive general recognition as diagnostic symptoms, hence the writer feels inclined particularly to call attention to their importance.

Lateral[1] deviation of the spine he believes to be practically a universal sign in Pott's disease,[2] and high temperature as a constant accompaniment of active tuberculous joint disease has been already discussed at length. Further experience has only served to confirm, in his opinion, the value of these two signs.

1. Muscular Stiffness.—On examining for muscular stiffness of the spine, the child is most conveniently laid face downward on a table or bed, and lifted by the feet. In a normal back the lumbar spine can be markedly flexed, and a general mobility is seen of the

[1] R. W. Lovett: Boston Med. and Surg. Journal, October 9, 1890.
[2] Ibid., April 17, 1890.

whole column. In patients where Pott's disease is present the region affected is held rigidly by muscular contraction when manipulation is attempted. In certain instances the erector spinæ muscles stand out like cords when the child is lifted, and it is questionable how much importance should be attributed to this sign. After having depended much upon it, the writer has come to the belief that it is not a sign of Pott's disease, and that it occurs in cases of hip disease, and in certain instances in excitable children where no joint disease is present. Lifting the patient by the feet in this way is practically sure to show the existence of lumbar or lower dorsal rigidity, but it does not detect high dorsal Pott's disease. In lumbar Pott's disease lateral mobility of the spine, as well as antero-posterior flexibility, is lost.

2. Peculiar Gait and Attitudes.—In considering the gait as a diagnostic symptom of Pott's disease, one must be prepared to find any or all the characteristic features absent. In general the walk is careful, steady, and military, and the steps taken with such care that jars to the spine are avoided; in other instances, however, the child walks with comparative freedom, even when the presence of the disease is manifest, and the well-known test of having the child pick up objects from the floor may fail to detect anything. It is only necessary to allude to the fact that these symptoms, usually assumed as characteristic, may be practically absent in clearly marked cases of Pott's disease.

Assuming, then, the extreme importance of the early diagnosis of the disease where practicable, it becomes necessary to consider in detail the general and local physical signs, according to the region of the spine affected.

Cervical Pott's Disease.—The most common symptom of the disease in this region, due to muscular rigidity, is the occurrence of wry-neck with stiffness of the muscles of the back and neck. This is often accompanied by distressed breathing at night, and intense occipital neuralgia. The head is held sometimes in a very much distorted position, and the most characteristic attitude is when the chin is supported in the hand; and when the patient turns sideways to look at objects, the whole body is turned. In severe cases one notices flattening of the back of the neck, with sometimes bony deformity. When spinal caries occurs in this region, the early

symptoms are most often confused with sprains, muscular torticollis, and inflammation of the cervical lymphatic glands.

From sprains the diagnosis is almost impossible. In the early stages of sprains of the neck the head is often held stiffly and to one side; motion is resisted and is painful, muscular spasm is present, and in the case of children of unintelligent parents the history cannot be accepted as valid. The writer has in mind a case which presented every symptom of Pott's disease in this region, where two weeks in bed cured all the symptoms, and the recovery has been permanent.

From true muscular wry-neck the diagnosis is often extremely difficult. In true torticollis manipulation is generally not painful, and one muscle is firmly contracted while the rest are relaxed. In congenital cases the head and face are distorted, and the eyes often are not upon the same plane. In Pott's disease, on the other hand, the muscular fixation involves all the muscles, and movement in any direction is resisted. It is more apt to be painful, and in most cases comes on with considerable rapidity. This applies fairly well to cases of anterior wry-neck; but in cases where the true muscular torticollis is of the posterior variety, and is due to a contraction of the deeper muscles, the diagnosis is much more difficult, for no one muscle is contracted, and movement is limited by a general muscular resistance. The writer has in mind certain cases where the diagnosis has been impossible, and some in which an operation of tenotomy has been performed in cases of Pott's disease where a most careful examination had seemed to establish the diagnosis of true muscular wry-neck.

In these obscure cases the differential diagnosis is extremely difficult, and can be most easily made by putting the patient to bed and seeing if the application of the extension is sufficient to overcome the distortion, as it will do in the course of a few days if due to Pott's disease. It is in this class of cases that the writer would particularly insist upon the value of high temperature as pointing to the presence of Pott's disease.

Inflammation of the lymphatic glands of the neck is likely to give rise to a position of the head simulating wry-neck, associated with muscular spasm. These cases simulate Pott's disease very closely, and in two cases under the writer's observation recently the diagnosis has been impossible until the inflammation of the glands was

subdued, and it was found that the head again became perfectly movable. In these cases it was impossible to determine whether the inflammation of the glands was secondary to the Pott's disease, or the muscular spasm was the result of the adenitis.

Upper Dorsal Pott's Disease.—In this region detection is the most easy because any bony destruction at once results in angular deformity, on account of the posterior curve of the spine in this part, and it is on this deformity that one must depend rather than on symptoms due to muscular stiffness.

The shoulders are, however, held high and squarely, the gait is military and careful, and lateral deviation is almost certainly present. In dorsal Pott's disease, paralysis may exceptionally be the first perceptible symptom.

The two affections with which dorsal Pott's disease is most likely to be confused are scoliosis and round shoulders. From rotary lateral curvature the distinction may be difficult in cases where the kyphosis is rounded and involves several vertebræ. The fact that lateral deviation of the spine is so constantly associated with Pott's disease is another factor in making the distinction more difficult.

In a case recently under the care of Dr. Bradford and the writer, for some weeks it was impossible to make a diagnosis between scoliosis and vertebral disease, in the case of a girl twelve years of age, and it must come to the mind of everyone under whose observation these cases come that there are certain cases where a distinction between the two is extremely difficult. As a rule, this is in very early cases, but in the case just alluded to the disease had been in progress for many years.

Here, again, the writer would call attention to the importance of high temperature as pointing to the presence of Pott's disease.

From round shoulders, Pott's disease is generally to be distinguished by the fact that in the former the spine is flexible, and the deformity rounded and not angular. In some cases of round shoulders, however, where the affection is of long standing, the curvature is more or less fixed, and pain may also be present, so that the resemblance to Pott's disease is marked; but these cases are uncommon, and the distinction is generally easily made.

Lumbar Pott's Disease.—Vertebral caries in this region of the spine is difficult of detection on account of the anterior curve of the

spine in the lumbar region, so that in any moderate amount of destruction of the lumbar vertebral bodies no posterior angular curvature is developed, and it is only in the later stages of the disease that any angularity becomes prominent. The occurrence of deformity is preceded by a flattening of the lumbar curve, which is characteristic and very significant. The attitude is that of lordosis, which in some cases becomes very marked; the gait is military and careful, and lateral deviation is always present, sometimes to a very marked degree. It is in this region of the spine that it is most conspicuous.

In using the ordinary tests to detect the disease in this region one is liable to be deceived by the readiness with which some children can bend the spine in picking up objects from the ground when lumbar Pott's disease is markedly present. This is due to an increased flexibility of the upper part of the spine. In many instances of lumbar Pott's disease the first noticeable symptom is a limp which is due to unilateral psoas contraction, the result perhaps of abscess, or perhaps only of psoas irritability, and psoas contraction must be set down as one of the common symptoms of lumbar Pott's disease. If the child is laid on its face and an attempt is made to flex the lumbar spine, it is found to be entirely rigid, and any attempt to hyperextend the leg in this position leads to the detection of the slightest psoas irritability.

Lumbar Pott's disease is most liable to be confused with single or double hip disease, with rhachitic curvature of the spine, and with primary inflammation of the psoas muscle.

The differential diagnosis between lumbar Pott's disease and hip disease is one which the writer often finds extremely difficult, although it is not generally considered so; but a long series of mistakes made by other surgeons, as well as by himself, have led him to consider the diagnosis as one which should be made with very great care. In general, when the hip symptoms are due to Pott's disease, and the joint symptoms are caused by psoas irritability, the restriction of motion in the hip is simply in the loss of hyperextension; while abduction and internal rotation are free and not affected. This limitation of motion in only one direction is generally sufficient, in connection with the other symptoms, to establish the presence of Pott's disease. On the other hand, in some cases

the limitation of the hip's motion is in all directions, and simulates very closely the limitation of true hip disease.

In a case of lumbar Pott's disease, which had been for some years under the writer's observation, suddenly a complete limitation of all the motions of the right hip occurred, and it seemed as if hip disease must be present. The child was kept quiet, and in the course of a few weeks the symptoms entirely disappeared, leaving the hip perfectly well, and in the whole time there never was any evidence of psoas abscess. The child in the last two years has been free from all hip symptoms. This case simply serves as a type of several which have occurred under the writer's observation where psoas irritability very closely simulated true hip disease.

Another element which leads to the confusion of the two affections is the rigidity of the lumbar spine which often occurs as an accompaniment of acute hip disease. If a child with hip disease is laid upon its face, and an attempt made to flex the lumbar spine by lifting the feet from the table, the irritability of all the muscles is so great that often the lumbar spine will appear to be completely rigid, and only a very careful examination will show that this is secondary to the hip disease.

Rhachitic deformity of the spine is a posterior curvature often so sharp as to be angular. It occurs at the junction of the dorsal and the lumbar regions. This junction is also the most frequent site of Pott's disease.

Rhachitic curvature of the spine is characterized not so much by muscular spasm as by persistent stiffness in most cases, so that if the child is laid upon its face, and an attempt is made to flex the spine, the curve is not obliterated. The symptoms, therefore, are the same that would be presented by Pott's disease occurring under the same conditions, and much dependence must be placed upon the coexistence of rickets.

In general, a posterior curvature of the spine in young children is much more apt to be rhachitic, but it may simulate Pott's disease so closely that a diagnosis is impossible. It has been the writer's custom to treat all such cases by rest in bed or on a frame, with the experience that in nearly every instance where the general signs of rickets were present, complete mobility was restored to the back within the course of a few months.

Primary inflammation of the psoas muscle would simulate lumbar Pott's disease, accompanied by psoas abscess, so closely that a distinction between the two might be difficult. There would, however, be no symptoms of flattening of the lumbar curve of the spine. There would probably be, however, some stiffness of the lumbar spine in making the ordinary tests, and lordosis would be present to a certain extent. Primary inflammation of the muscle, however, is very rare, and its existence should lead to the suspicion of Pott's disease, and the only distinction that could be made would be the absence of bony change, and a greater flexibility of the lumbar spine where only the muscle was involved. In most cases, however, it would be safer to assume that lumbar Pott's disease was present, and fortunately the treatment of the two affections would be identical.

Pain.—A word should be said with regard to the significance of pain as a diagnostic symptom in Pott's disease. In most cases it is referred to the terminal part of the spinal nerves, and the pain is most often complained of in the front of the chest, and in the abdomen, where it often passes for stomach-ache. In other instances severe pain is felt in the legs where the disease is low down, and in cervical disease it takes the form often of a severe occipital neuralgia; but the absence of pain, as has been said, is not to be taken as evidence of the absence of the disease. Pott's disease is, in general, more often accompanied by pain than hip disease, for example; but, on the other hand, certain cases pass from the earliest to the latest stages with little or no pain, and the former diagnostic tests of lifting the child suddenly, making pressure upon the head, and the like, can be set down as not only harmful, but entirely useless.

The same may be said with regard to tenderness over the spine, which is often assumed to be a diagnostic symptom. It is in most cases absent, and if it is present it shows nothing, and is of no diagnostic importance whatever. On the other hand, the occurrence of persistent abdominal or chest pain in a child is a symptom which should be allowed more weight than it ordinarily receives in the hands of the family physician, and although it is in no way a diagnostic symptom of Pott's disease, yet it is so often due to that affection that its presence should lead to a very careful examination to detect, if possible, the early stages of the disease.

3. Lateral Deviation of the Spine.—The writer believes that a noticeable amount of lateral deviation of the spine is an early symptom of the existence of Pott's disease, and occurs in practically all cases of dorsal or lumbar disease. It is a symptom due to muscular spasm, and is early rectified by treatment. In cervical disease it is often present, although it cannot be set down as a uniform accompaniment of the disease in this situation.

4. High Temperature.—In a large series of observations relating to Pott's disease in the acute stages it has been the writer's experience that a high evening temperature is almost uniformly present, and that it occurs independently of abscess formation, and is no higher in cases of abscess than in cases without abscess. The rise of temperature is from one to three degrees, and in general it can be accepted as indicating roughly the degree of severity of the disease.

The Diagnosis of Abscess.—The diagnosis of abscess in Pott's disease rarely presents any difficulty, but in certain instances their occurrence is attended with peculiar symptoms which may give rise to some obscurity. In the cervical region the most common seat of abscess formation is in the back wall of the pharynx, where it often persists for some time unrecognized, giving rise to a peculiar series of respiratory symptoms. The pharyngeal wall is pushed forward, and the child breathes at night with a peculiar snoring respiration, which is to a certain extent characteristic. There is some difficulty in swallowing food; the pain is apt to be severe; and occasionally a swelling extends so much to the side as to be noticeable at the sides of the neck. The finger introduced into the mouth comes upon a projecting swelling of the back of the pharynx, which is characteristic and not to be mistaken.

In the dorsal and lumbar region the abscesses point for the most part in the loin, or follow down the course of the psoas muscle to appear in the upper part of the thigh or groin. Appearing in the back, the abscess is not likely to be mistaken for anything unless for a cellular abscess of the back muscles, which is not an uncommon occurrence in young children.

Appearing in the groin, the abscess may be mistaken for hernia, which it sometimes resembles rather closely, and gives a certain obscure impulse on coughing; but it is irreducible, and the part of

the psoas muscle within the abdomen can be felt to be enlarged and resistant. Psoas contraction is present, which causes flexion of the leg. Psoas abscess due to Pott's disease cannot be distinguished from psoas abscess due to other causes except by the presence or absence of the diagnostic signs of Pott's disease.

The Diagnosis of Paralysis.—Paralysis in Pott's disease, although ordinarily one of the later symptoms, may occasionally precede the deformity, and be the first sign of the presence of vertebral disease. Such cases are not so rare that they should be overlooked. The occurrence of myelitis in a young child should be considered as extremely suspicious, and as being more likely to be due to Pott's disease than to any other cause, even if the signs of vertebral disease are obscure or apparently absent. In general the paralysis is preceded by a stage of the disease in which this pain is much increased, and this pain may be paroxysmal or steady.

The first thing noted generally in the paralysis is a tendency to tire easily, and to hit the toes in walking. A disability to use the legs much and a staggering gait follow this very closely, and along with it is often a jerking and twitching of the legs at night, with an occasional cramp of the muscles. When such paralysis occurs in connection with disease of the cervical and dorsal regions, the patella reflexes are much increased and ankle clonus is present to a marked degree. In disease of the lumbar region, however, the pressure may be upon the cord below the reflex centres of the cord, and the patella reflex may be absent as well as the ankle clonus. The paralysis is generally one of motion only, but in severer cases sensation is impaired or lost. The paralysis may be either a slight disability or a complete loss of power, and its general diagnostic symptoms are those of myelitis.

SYPHILITIC SPONDYLITIS IN CHILDREN.

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On October 15, 1886, before the Section on Orthopedic Surgery of the New York Academy of Medicine, I read a paper entitled "Syphilitic Joint-disease in Children," and exhibited patients with the disease located at the ankle, knee, hip, wrist, and finger-joints, and in the spine. All cases had been treated by immobilization, and each case had been experimentally observed for varying periods with and without anti-syphilitic medication until the diagnosis had appeared to me to be conclusive, when each was finally placed upon the treatment that was continued until its final cure.

Notwithstanding the fact that these cases differed somewhat in their clinical aspects from ordinary tuberculous disease when located in the various joints; that nearly all gave a clear history of syphilis in the parents, and at some time in their course had presented other well-recognized syphilitic lesions; that while under the anti-syphilitic medication all had shown marked improvement, which they had failed to show under immobilization alone—notwithstanding these things, no one of the orthopedic surgeons present was willing to admit that the joint-lesions presented were syphilitic, but insisted that they were all of the ordinary tuberculous variety. One eminent man went so far as to say that in his extended experience in the treatment of chronic joint-disease he had frequently observed the curative effects of mercury upon tuberculosis. Indeed, so unanimous and positive was the opinion among my colleagues that there was no such thing as syphilitic joint-disease that I had not the temerity to publish my paper. However, five more years of observation have not only confirmed the views that I then held, but I have been led to believe that syphilitic joint-disease is of much

more frequent occurrence than I then supposed, and I have ventured once more to bring forward a portion of the subject for consideration.

All of my observations have been among children in whom there was no evidence of a primary syphilitic lesion, and in very many I have sooner or later been able to trace a syphilitic taint in one or both parents; on this alone I have felt justified in assuming that the disease was inherited. It should be known that no microscopic examination has been made by me to demonstrate the presence of the syphilitic bacillus or the absence of the tubercle bacillus, and that I do not profess to know what relation exists between tuberculosis and syphilis in the second and third generation. Clinically, however, there can be no doubt of their relation. Ricord and Maisonneuve taught that syphilis, especially in the tertiary form, could be transmitted to the offspring as scrofula, phthisis, and rhachitis; and Bumstead and Taylor (*Venereal Diseases*, fourth revised edition, p. 735) say: "Syphilis is generally transmitted only to the second generation; exceptionally, in a case of excessive activity of the disease in the first inheritor, it may appear in the third generation."

The diagnosis of syphilitic joint-disease in a child does not necessarily imply an accusation of one or both parents, for, if "one-third of all children procreated of syphilitic parents are dead-born, and of those born living 24 per cent. die within the first six months of life," and if "in case of infection of both parents the disease is likely to be transmitted in an extreme form, resulting in death of the fœtus, or in the early manifestation of symptoms," it would not be unfair to conclude that some cases of syphilitic joint-disease in children that appear as late as from the tenth to the fifteenth year, like some other syphilitic symptoms, may have been transmitted from the original sin of a grandparent, the parent having escaped, or at least having never been conscious of any syphilitic manifestation. Bearing upon this, let me again quote from Bumstead and Taylor: "These cases of late development are rather rare, although we have seen fully two dozen in which there were such lesions at the third, sixth, eighth, twelfth, fifteenth, and twentieth years. . . . . Besides the cutaneous and visceral lesions of the first year or two, other syphilitic affections are frequently observed. In many cases the diaphyso-epiphyseal lesions of the bones appear during uterine life, and run

their course in the early months of the disease, possibly relapsing at a later period; or they may appear for the first time during the first year of life. From the fourth up to the twentieth year the shafts of the bones may be affected by periostitis, and joint-affections often occur. . . . . Dactylitis is usually observed in very young children; it may also occur as late as the twentieth year." Notwithstanding this teaching, and that of numerous English, French, and German observers, syphilitic joint-disease in children has no place in the orthopedic literature of this country.

One gentleman, who had the opportunity of examining all of the patients reported upon in my former paper, said that he did not consider any of them as cases of syphilitic joint-disease, but as "tubercular joint-disease modified by inherited syphilis." It has seemed to me that it would be a more correct expression of the condition, provided the tubercle bacillus can be demonstrated to be present in these lesions, to call them syphilitic joint-disease modified by tuberculous infection. It is well recognized that traumatic joint-affections, if neglected in treatment and prolonged by use, readily become infected with the tubercle bacillus; and it may not be an unfair assumption to claim that the bone and joint lesions due to syphilis in the progenitors, when neglected or refused remedial medication, also readily become the seat of tuberculous infection. The symptoms, prognosis, and treatment of these cases are quite different from the cases primarily traumatic or tubercular.

The following case, which is not an imaginary one, is instructive:

A young child, of a clean mother, but whose father at the time of the conception was suffering from tertiary syphilis, developed chronic disease of a joint; he was treated with anti-syphilitic remedies and kept in bed, but without mechanical restraint, and recovered after a few months, with a joint normal in all its appearances and functions. Subsequently he developed a chronic disease in another joint, which presently exhibited the same symptoms and signs that had been observed in the former joint-affection. He was now subjected to mechanical treatment without medication. An abscess appeared and was allowed to open spontaneously. Once or twice a fortnight this sinus was exposed for some time in a room crowded with patients suffering from tuberculous lesions; it was washed with water from a dirty tin basin that had been used for years by hundreds of patients

for washing away the discharge from tuberculous sinuses, and it was then dressed with a pad of common oakum taken from an open box, in which it had lain for months, exposed in this room daily crowded for three or four hours with patients dripping with tuberculous pus. At the end of some months of this treatment the surgeon in charge, as he afterward told me, confirmed his diagnosis of tuberculous joint-disease by finding tubercle bacilli in the discharge from this patient's sinus. The patient continued for more than two years under the most approved mechanical treatment without apparent improvement in the condition of the joint or diminution in the amount of discharge from the sinus. Then, under a comparatively short course of mercury and iodide of potash, the sinus closed and all symptoms of joint-disease disappeared—leaving behind, however, a deformed and stiff joint.

Syphilitic spondylitis differs in no way from syphilitic joint-disease located elsewhere, except as it is modified by its peculiar surroundings. In the superficial joints, where the infiltration of the soft parts and bone can be readily seen and felt, the onset of the disease is very slow, and months may pass before pain is complained of or disability becomes serious; but in the spine, where the lesion is located in and about the anterior surface of the vertebral bodies, far beyond sight and touch, the slow advance of the early symptoms escapes recognition and the onset usually appears to be comparatively rapid. On any motion the distant pain is complained of, and sometimes within a few days the patient is unable to stand without support. If located in the dorsal region, the kyphosis soon appears with a sharp angle, formed of but one or two spinous processes, and with a long sweeping curve above and below. In the lumbar region, the kyphosis is slow to appear, often not appearing until marked psoas-contraction can be made out, and perhaps not until an abscess has formed; but lordosis is an early and well-marked symptom.

When the disease is once established, it seems to follow the rule of all syphilitic lesions, and is a cumulative process rather than one of degeneration—it is a hyperplasia rather than a molecular disintegration. When a certain point has been reached, resolution takes place, or the new tissue dies and an abscess rapidly forms. If the abscess can be evacuated under favorable conditions the disease often goes on to a rapid and complete recovery. Abscesses that are not

within reach will almost invariably undergo rapid resolution when the patient is once well under the influence of the mercurials.

If no syphilitic history can be obtained from either parent, and if it cannot reasonably be suspected, an examination of the spine alone may not be sufficient to warrant the diagnosis of syphilis. Other things must then be taken into consideration; for, although a syphilitic spine may, and no doubt does, often exist without there being or having been other syphilitic lesions, the presence of such lesions is evidence of such value that the patient should always be carefully examined.

Spondylitis in very young children, that is to say, under three years of age, and spondylitis associated with chronic disease of some other joint, or in another portion of the spine separated by a healthy area, is in my experience more often syphilitic than tuberculous. Such cases always repay a careful examination and a strict watch for the appearance of other syphilitic manifestations, namely, nasal catarrh with the formation of reddish-brown crusts, suppurating otitis, corneal opacities, interstitial keratitis, Hutchinson's teeth, periostitis, cutaneous eruptions, and sores about the anus and genitals. In my experience, the most common associated symptoms have been the bone and joint lesions at some distant point, and the least common have been the skin-eruptions.

The treatment of syphilitic spondylitis should be both mechanical and medicinal; but the mechanical plays by far the less important part, and rest in bed or on some form of portable bed will be found to be more demanded than braces. Rest in the recumbent posture during the painful stage is absolutely essential, while the application of specially devised apparatus may be looked upon more in the light of a luxury than a necessity. The medicinal treatment consists of mercury and iodine. Large doses should be used; if the stomach will tolerate it, as much as one-thirtieth to one-twenty-fourth of a grain of the bichloride or biniodide, with from five to forty grains of potassium iodide three or four times a day. If the stomach proves irritable, mercury with chalk in from three- to five-grain doses, with inunctions of blue ointment, are advisable. Tincture of iodine in from one- to ten-drop doses may be given. It will be found that these children usually bear these medicines in as large doses and as well as do adults.

DISCUSSION.

Dr. Benjamin Lee, of Philadelphia, said that the author spoke as if some doubted the very existence of syphilitic spondylitis. He had not been in the way of seeing a great many of this class of cases, but two had come under his observation, and he would not hesitate to pronounce them syphilitic.

POTT'S DISEASE AND PREGNANCY.

By T. HALSTED MYERS, M.D.,
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The subject naturally divides itself into two parts—the effects of Pott's disease on pregnancy, and the effect of pregnancy on Pott's disease.

The regions of the spine which are of interest to us from their relation to the gravid uterus are the lower dorsal, the lumbar, and the sacral. A kyphosis in the lower dorsal necessitates an increased inclination of the lower ribs to the pelvis, and in the marked cases these sink deeply between the iliac crests. In the mid-lumbar region the deformity is not apt to be so marked; in fact, exceptional cases are seen here in which there is no curvature (Percival Pott: vol. iii. p. 473, ed. 1873); but in the lumbo-sacral region the deformity is again greater, owing to the diminished inclination of the pelvis. Were it not for the compensatory curvatures, these deformities would be even more marked.

In all these cases the abdominal cavity is diminished in its vertical diameter, and in the first instance also laterally, from the pressure of the ribs. Furthermore, abscess usually complicates disease in these portions of the spine, and this may still further diminish the capacity of either the abdominal or pelvic cavity. (Zweifel reports such a case: *Lehrbuch der Geburtshülfe.*)

In the pelvis, too, we find changes due to the spinal disease. A caries, in very exceptional cases, is still given as the cause of spondylolisthesis, and there seems to me no reason why disease of the sacro-lumbar junction could not produce this effect. The kyphotic pelvis is, however, the one we expect to find associated with Pott's disease. I refer you to Winckel's *Text-book on Midwifery* for an excellent description of these changes. The great majority of

cases of Pott's disease occur in children, and the younger the patient, other things being equal, the greater the consequent pelvic changes, which have been proven by Breisky to be due to the change in the direction in which the weight of the trunk is carried to the upper surface of the sacrum. Osteitis at the lumbo-sacral junction will produce atrophy of the growing bones involved, just as elsewhere; and bone-erosion here will cause, by the compensatory lumbar lordosis above, a deformity like the "pelvis obtecta," or even simulate a spondylolisthesis if of more severe degree. A kyphosis in the lumbar region will diminish the inclination of the pelvic plane, but in the dorsal will generally increase it from the compensatory lumbar lordosis. A lateral deviation will diminish the pelvic cavity on the side of the convexity (Parvin: *Amer. Sys. Obstet.*, p. 752). Barbour has proven that the lower the spinal disease the greater is the increase in the conjugate diameter of the brim, but that the second characteristic feature of this pelvis, the contraction of the transverse diameter at the outlet, is not definitely related to this (*Spinal Deformity in Relation to Obstetrics*).

In these cases of kyphotic pelves only the voluntary forces of labor are much affected. These are impaired directly in proportion to the deformity on simple mechanical principles, and the obliquity of the uterine axis prevents the effective application of that strength which remains. The histories of these cases show that the delay usually occurs in the second stage. However, there are a considerable number of cases of labor in tabetic and paraplegic women reported, which prove that the assistance of the abdominal muscles is not absolutely necessary to the accomplishment of parturition in the absence of obstruction from deformity of the pelvis or from resistant soft parts at the outlet (Benecke: *Zeitschr. f. Geburtshülfe u. Gynäk.*, i. 77, 28; Parvin: *Amer. Syst. Obstet.*, vol. i. p. 704; Farre: *Tanner on Pregnancy*, p. 337; Epley: *N. Y. Med. Journ.*, 1883, xxxvii. 233, etc.

The essential involuntary muscles, luckily, cannot be much affected by disease of the spine, since though the motor centre of the uterus has not been satisfactorily demonstrated yet, it has been located in the medulla (Winckel), in the hypogastric plexus (Frankenhauser), in the brain or cord (Kehrer), and in the peritoneal coat of the uterus (Dembo), so that amid these conflicting opinions we must con-

clude that the uterus may be excited to contraction by the most varied peripheral and central influences, and that destruction of all its motor ganglia is well-nigh impossible, however marked the lesion.

To consider now the effect of pregnancy on the Pott's disease. The indication *par excellence* for treatment in Pott's disease is acknowledged by all to be the removal of the weight of the trunk from the bodies of the diseased vertebræ. The mechanical effect of a weight placed anteriorly is a most disastrous crushing together of these very vertebral bodies, already softened by disease and totally unable to sustain even the ordinary weight of the body. The probability of abscess-formation, estimated at 70 per cent., in the lumbar region (Parker: *Brit. Med. Journ.*, January 12, 1884), with all the danger that that involves, is, therefore, greatly increased by the weight alone of the gravid uterus. The danger of rupture of already existing abscess, or of precipitating pressure paralysis, is aggravated. Aside from this, also during gestation a hyperæmic condition of the cord and its membranes, and of the pelvis generally, is thought or known to exist (Hasse: *Krankheiten des Nerven Apparates*), and the effect of this on existing disease of the vertebræ must be pernicious. I would call attention also to the anatomical fact that new centres of ossification appear in the vertebræ at sixteen years, and again at twenty-one years, indicating an unusual activity of the nutritive processes at these periods—a condition favorable to the onset of Pott's disease, or rekindling of old inflammatory foci. This fact is important, as at this age marriage most often occurs.

Is it safe for a girl who has, or has had, Pott's disease in these locations to marry? To answer these questions I have studied the histories at St. Luke's Hospital and at the Sloan Maternity; Dr. Shaffer has also kindly placed the New York Orthopedic Dispensary records at my service, and I have received valuable aid from Drs. Partridge, Lusk, R. A. Murray, Coe, Garrigues, Gibney, and Tucker.

From the data at my disposal, it appears that of the 32 married women observed 10 are *known* to have died from causes directly connected with the disease (2 from operations necessitated by the contracted pelves, 3 of phthisis, 4 from exhaustion from abscess, 1 from cerebro-spinal meningitis)—a mortality of 31 per cent., which

is probably too small, as many of the histories are not complete; while of 62 other cases, occurring in unmarried women over sixteen years of age, but 2 are *known* to have died. While I do not think this shows the true ratio, I do believe it indicates a greater mortality among the married women.

I have collected 24 cases of labor occurring in 14 *cured* cases of Pott's disease of the lower dorsal, lumbar, or sacral vertebræ, and find that *in no instance has there been a rekindling of the old disease.* The chief danger to the mother in these cured cases lies, therefore, in the malformations produced in the pelvis and abdomen, and in the great strain on a vitality already enfeebled. Indeed, Neidert (Inaugural Address, Munich, 1886) found that the cause of death in patients with severe deformity whose spinal disease had been cured was generally heart-failure.

I have also notes on 7 cases in which *active* Pott's disease complicated pregnancy (4 dorsal, 3 dorso-lumbar). In 6 of these the pregnancy either originated or greatly increased the severity of the disease. In the remaining case, though an active stage of the spinal osteitis existed, pregnancy and parturition were peculiarly harmless under careful protective treatment, and the patient is to-day well. On account of the great rarity of these cases, I will give a brief outline of each.

Case I.—Mrs. O. D., aged twenty-two years. Duration of disease, one year; location, ninth dorsal to second lumbar. Conception when disease had existed nine months. Child born at term, easily; slight increase in pain for two weeks. Cured a few months later.

Case II.—Mrs. M. J. R., aged twenty-three years. Duration of disease, four months; location, mid-dorsal. Fourth child born after disease had existed two weeks. Labor easy. Died from rupture of abscess into œsophagus two and a half years later, after having three attacks of paraplegia.

Case III.—Mrs. M. D., aged thirty-three years. Duration of disease, fifteen months; dorso-lumbar region. Conception with onset of disease. Instrumental delivery. Lumbar abscess followed; exhaustion; phthisis. Death in twenty-two months.

Case IV.—Mrs. E. C., aged twenty-four years. Onset of disease with birth of second child; lower dorsal region. A third

child, born nineteen months later, again prostrated mother greatly, and she died soon after. Cause unknown.

CASE V. (Benecke's case).—Aged twenty-eight years. Mid-dorsal region. Disease began with last (tenth) pregnancy. Complete paraplegia had developed before labor, which was, of course, painless, but otherwise normal. At last note patient was completely paraplegic.

CASE VI.—Mrs. E. F. D. Lower dorsal. Married at thirty years. Disease developed with birth of first child; increased steadily. After second child, born seventeen months later, mother became paraplegic. Labors easy and at term. Gradual, slow recovery. Twenty-one years later: remains cured.

CASE VII.—Mrs. R. Duration of disease, six years; lower dorsal. Third child born four and a half months after onset of disease; fourth sixteen months later; fifth three years after last. Great deal of pain during gestations; relieved soon after labor. Now tires easily, and at times has epigastric spinal pain.

Cases I. and VII. immediately followed severe traumatisms, which suggests fracture as the original lesion.

Dr. Shaffer has also given me an "intermediate" case of great interest. There had been no symptoms for a year and a half, yet patient (Mrs. W.) wore a brace still, and felt she needed its support. Easy labor at term occurred, and no untoward symptoms in the spine resulted.

We have four points to consider in reference to treatment: Is the diseased cured or progressive? Is the pelvis contracted or practically normal?

Cases of spinal caries come to us naturally as orthopedic surgeons, and we must remember that changes are caused in the pelvis by spinal disease at a distance, even in the lower dorsal region if it occurs during the period of active growth. It is our part to make the diagnosis, as it is very important that these cases should be put into the obstetrician's hands at as early a period of gestation as possible, in order that abortion or premature labor may be induced, if necessary.

In case the Pott's disease is cured, the amount of pelvic deformity will be our guide as to treatment. There can be no fixed rule in these cases; each must be judged by itself. The researches of

Sulger-Buel demonstrate that normal birth often follows where measurements would indicate that it was impossible (*Arch. f. Gynäk.*, Band xxxviii., 1890). The maternal mortality Barbour found to be 59 per cent. in thirty-two cases, and Winckel found it 66 per cent. in twenty-one cases, yet neither of these observers speak of active spinal disease complicating their cases—so, I presume, do not take this additional danger into account.

We are still confronted with the question, What will be the effect on the diseased vertebræ? My cases show very plainly that in *cured* cases no injury has been done; furthermore, none of the gentlemen I have referred to have ever seen in a single instance the tubercular process rekindled by the traumatism of labor. On the other hand, the cases in which pregnancy complicated active disease of the spine tell no uncertain tale either, and in view of them I should advise the termination of pregnancy, in case the disease were active, at the earliest possible date in almost every case.

DISCUSSION.

Dr. Charles C. Foster asked the opinion of the members of the Association as to the desirability of advising women who have had Pott's disease not to marry.

Dr. H. L. Taylor knew of very many cured cases where marriage had been followed by the birth of healthy children. The simple fact of the existence of Pott's disease, in his opinion, did not justify one in advising against marriage.

Dr. George W. Ryan thought it was chiefly a question of the advisability of advising marriage in the tuberculous, for Pott's disease is but one expression of tuberculosis. He knew of two married women who had had Pott's disease, one of whom had had three children, and the other two, and none of these children presented any evidence of tuberculous taint.

Dr. R. H. Sayre said that, under ordinary circumstances, he could not agree with the author as to the propriety of advising

premature delivery in these cases. He had observed one case of Pott's disease in the sacro-lumbar region, and yet she was delivered by forceps without any especial difficulty.

Dr. Samuel Ketch had at present under his care a woman who had become pregnant, gone to full term, and had a healthy child during the progressive stage of Pott's disease. She is still under mechanical treatment, and is naturally robust and healthy.

Dr. Ap M. Vance had seen a number of these cases, and had thought that parturition had presented about the average difficulty. The mother, however, was liable subsequently to suffer from the depressing effects upon her system of the pregnancy and of lactation.

Dr. H. A. Wilson, of Philadelphia, was of the opinion that, owing to the greatly improved statistics of the modern Cæsarean section, gynecologists would not give such advice as was contained in the paper. He knew of a case on which Cæsarean section had twice been successfully performed.

Dr. Benjamin Lee believed it was extremely rare for Pott's disease, even in the lumbar region, to produce a narrowing of the pelvis. He had had under his care a little lady with a very large prominence in the lumbar region, and who had Pott's disease between twelve and sixteen years of age. She has had twelve children, and although she has at times required the aid of forceps, none of the deliveries could have been particularly difficult or dangerous. She is at present in very fair health, as are also the living children, with the exception of one with infantile paralysis. We should not advise against marriage unless there is present a deformed or contracted pelvis. His experience had been that the physician was likely to be consulted in regard to the advisability of marriage, and he had found that careful mothers were usually very anxious about the future of their daughters with Pott's disease. With regard to the propagation of tuberculosis, he could not recall a single instance in which consumption of the lungs had followed what is supposed by most physicians to be invariably tubercle in the spine.

Dr. A. J. Steele, of St. Louis, referred to a case in which a brace was applied to the spine and an abscess absorbed. He was consulted subsequently concerning the question of marriage, and gave a favorable opinion. The first labor was with forceps, and since then she has had five or six healthy children, and the mother herself presents no evidence of general tuberculosis, nor do the children. We are likely to be consulted about the marriage of people not only with spinal disease, but with chronic disease of other joints.

Dr. Myers, in closing the discussion, said that in his cases the children, so far as he knew, were healthy. Parturition, as a rule, was not severe, except in cases of very marked deformity of the pelvis. The diminished power of the abdominal muscles which is present in these cases causes delay, principally in the second stage, and this usually can be overcome by forceps. His statistics show that in cases where the disease is active, however, the mother suffers severely, either at once or soon after, and that the mortality is very high. But where the disease has been cured, there seems to be no danger of rekindling it, and the risk to the mother depends on the amount of deformity present.

CONGENITAL DISLOCATION OF THE HIP.

By A. M. PHELPS, M.D.,
NEW YORK.

Some two years ago Dr. John Ridlon, of New York, reported a case of congenital dislocation of the hip, the head of the bone resting on the pubes. This dislocation forward and upward is unusual. However, within a year, two other cases came to my clinic at the Post-Graduate Medical School and Hospital, with the same deformity.

The deformity in each case was precisely the same. They were, in fact, anterior and upward congenital dislocations of the head of the femur. The child, illustrated in this article, had always been healthy; there was no history of injury in the case; nor of any severe labor. The mother noticed that when the child began to walk, one leg was shorter than the other, and that the feet and toes were turned out. Figs. 1 and 2 are cuts made from photographs taken of the case when first seen. They show the outward rotation and shortening seen in anterior dislocation. The case was three years old when I first saw it. I applied a long traction splint, which the child wore for a year and a half, when it died from acute meningitis. A post-mortem was permitted, and I have the specimen here, which with your permission I will now present.

Figs. 3 and 4 are drawings of the specimen made by Dr. Macdonald, and they very correctly represent the pathological condition found.

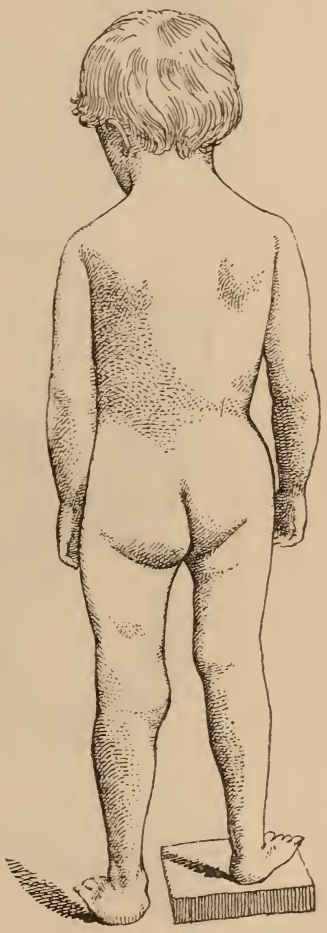
In the first specimen the head of the bone is seen above the rim of the acetabulum dislocated upward and forward. The capsule of the joint is cut away to give the view.

In Fig. 4 the acetabulum is seen to be angular in shape, small, and undeveloped, with the remains of the ligamentum teres. This specimen is of great interest, I believe, because so far as I know it is

the only pathological specimen of anterior congenital dislocation of the hip reported, and it will be found of great value in studying the etiology of this deformity. It will be observed that the pressure of the head of the bone has changed the form of the anterior border of the acetabulum from concave to convex.

Fig. 1.

Fig. 2.



Etiology.—It has been taught, and it is accepted by the profession generally in America and in England, that congenital disloca-

tion of the hip is a secondary condition, depending upon the non-development of the acetabulum.

Fig. 3.

This specimen is surely a case of congenital dislocation primary, with non-development of the acetabulum from non-use.

I am not prepared to say that all cases are like this, but surely

here is a case of congenital dislocation *in utero* not due to non-development of the acetabulum.

Fig. 4.

Dr. Cornigan, who, by the way, has written an excellent monograph on this subject, believed that the dislocation was a primary one, due to reflex spasm of the muscles *in utero*, caused by some central nerve lesion in early fœtal life.

A glance at the anatomy of the hip-joint will show that the muscles pass diagonally across the body from the shaft of the femur to the pelvis, being in a line with the axis of the neck of the femur.

It seems to me that dislocation of this bone could not take place by the contraction of these muscles, but, on the contrary, that contraction of the glutei muscles, or of any of these groups, would tend to press the head of the bone more firmly into the acetabulum. A long-continued spasm of muscle, sufficient to cut away the acetabulum, would destroy the head of the bone and produce a true inflammatory disease of the hip-joint.

Heredity, no doubt, has much to do with producing this deformity Dupuytren relates the history of a case—Marguerite Cardas—who had two aunts on the maternal side affected with lameness from their earliest attempt at walking. Marguerite's father had a sister lame from birth on the right side, who died at eighty years of age. Another sister, well formed, gave birth to a child with shortening of the right inferior extremity. This woman has a daughter by a healthy man with three inches of congenital shortening of the right leg. This girl also married a healthy man, but his father had a congenital dislocation of the right femur. She has had four children, two of whom present the hereditary infirmity.

Similar cases are numerous, and it will be difficult to doubt that hereditary predisposition exerts some influence over the recurrence of this deformity in children whose parents or ancestors have been affected by it.

Ambrose Paré, 1678, book xvi., page 347, says of hereditary causes: "such as parents transfuse into their offspring; hence it is that crooked, not necessarily, but ofttimes, are generated by crooked, and lame by lame."

Also, " Hippocrates himself avers that infants in the very womb may have their joints dislocated by a fall, a blow, or compression."

Among the other causes enumerated are:

1. An original defect in the organization of the germ, or the operation of the formative power. (By Dupuytren.) This hypothesis has no support in embryogeny.

2. Arrest of development of the cotyloid cavity. The pathological specimen here presented was certainly not produced by this cause.

3. Certain articular maladies occurring in the fœtus during intra-

uterine life. No doubt diseases of the joint might occur which would produce a diastasis or even the destruction of the acetabulum, leading to a dislocation.

4. Diseases of the primitive nerve centres are said to cause a perverted condition of the excito-motor apparatus of the medulla spinalis, producing a spasm of the muscle, and resulting in dislocation. This is the favorite theory of Dr. Cornigan and M. Guerin; but I have already stated that the anatomy of the joint is such that muscular spasm, independent of other causes, could not produce dislocation of the hip. It is true that in anencephalous fœtal monsters congenital dislocation of the hip, club-foot, and other deformities are found, but there must be other pathological conditions present favoring these deformities, because many of those monstrositie have no deformity of the extremities whatever.

It seems to me that if spasm of the muscle *in utero* produces dislocation of the hip, it ought always to produce it in the same direction, but we find that the usual form is upon the dorsal of the ilium, and this specimen which I present is one upward and forward, and Dr. Cornigan says that the dislocation may take place downward and forward, or downward and backward.

These facts, together with the peculiar anatomy of the hip-joint and the direction in which the muscles operate upon the femur, lead me to believe that this is not one of the causes *per se* of congenital dislocation of the hip.

A few years ago I saw a child one hour after it was born. The right limb was an inch shorter than the left, and there was a dislocation on the dorsal of the ilium. I manipulated the limb in the usual method and reduced the dislocation, and the head remained in place without a retaining apparatus. This was clearly a case of dislocation which had taken place during confinement. If the deformity had not been noticed until the child began to walk, any physician would have said that this was a case of congenital dislocation of the hip.

Mr. C. B. Lockwood presented at the London Pathological Society two specimens of infants illustrating the absence of the margin of the acetabulum with and without displacement of the head of the femur. (See *Transactions* of that Society, 1887, vol. xxxviii., page 303.

The first case is one of microcephalic fœtus, probably born at full term ; a case of double breech-presentation, and after birth the thighs remained flexed upon the abdomen. The pelvis was quite well formed, with the exception of the acetabulum. The cartilaginous rim of that socket was entirely absent, otherwise the joint was normal. The capsule was capacious ; the ligamentum teres longer than usual. The head of the femur was normal, lying upon a flat surface.

The second case shows absence of the margin of the acetabulum with displacement of the head of the femur upon the dorsum of the ilium. This was a breech-presentation. After birth the thighs remained flexed upon the abdomen and the legs over-extended upon the thighs. There was an ectopium of the abdomen, with considerable protrusion of the viscera—of the liver, etc.

The brain and spinal cord seemed normal. The head of the radius was displaced on to the front surface of the ulna, and the carpus toward the flexor aspect of the radius and ulna ; both hips were displaced upon the dorsum of the ilium, with changes of all structures entering into the formation of the joint. The head of the femur was irregular in shape. The cartilaginous margin of the acetabulum was absent, although the cotyloid depression seemed exceedingly deep, but not triangular. The ligamentum teres was exceedingly long, and capsular ligament capacious.

Summary. Congenital dislocation of the hip is produced, I believe, by injury at birth ; injury *in utero*, or disease *in utero* ; rhachitis ; hereditary influences, and, in exceptional cases, if such there are, by arrest of development of the acetabulum.

Many of the pathological specimens reported, after excisions for old dislocations, demonstrate that the acetabulum ceases to develop and undergoes atrophic change after the head of the bone has been dislocated. It is easy to conceive of disease attacking one or both hips *in utero*, producing effusion into the joint, with or without destruction of the head ; resulting, through reflex spasm of the muscle, in dislocation of the head of the femur, which is frequently seen in hip-joint disease.

I am inclined to believe, judging from the pathological specimen here presented, and from the case of dislocation at childbirth which I saw, together with pathological specimens which have been reported

by Mr. Adams, which I have personally examined in the Pathological Museum in London, that the deformity is more frequently produced by violence of some description, or by pathological changes the result of inflammation, than from any other cause.

We are all familiar with the "loose joints" in certain individuals who are capable of producing dislocation of almost every joint in the body. I now have a patient who can easily dislocate the right hip and reduce the dislocation, and it gives her no inconvenience.

Given this condition *in utero*, slight causes would suffice to dislocate the head of the bone. If this occurred early in intra-uterine life, the child would probably be born with congenital dislocation and an undeveloped or absent acetabulum.

If the head of a bone has long been dislocated, the surgeon finds when he performs an excision that the joint itself is filled with new material. I have observed this in the excision of the shoulder-joint, performed for old dislocation of only six months' standing.

If a dislocation occurs in a rapidly-growing fœtus, on account of hereditary causes (a long relaxed ligament), or by violence in child-birth, and the deformity is not discovered until the child begins to walk at the age of fifteen months, it should be expected that the acetabulum would be absent or undeveloped.

Treatment.—The treatment is divided into mechanical and operative. Complete excision of the joint has been performed and good results reported.

Cutting down and making a new acetabulum in the dorsal of the ilium and nailing the head of the bone into it, has met with some favor.

These two operations are advisable only in adults or in children over seven or eight years of age.

The operation of Hoffa, of Würzburg, in small children seems to me the most rational one to perform. He makes an incision down on to the head of the bone; scoops out the acetabulum, cutting deeply into the bone, and reduces the head to its normal condition. He claims excellent results from this.

The operation is performed only on children under five years of age, and where it is an impossibility to pull the bone down to the old acetabulum.

Operations of this magnitude are serious, and must be attended

with considerable mortality. Still, the results of mechanical treatment in the past have been so discouraging that the surgeon now feels justified in performing any of the operations which promise satisfactory results.

The mechanical treatment of hip-joint disease has always been unsatisfactory until the case of Mr. Buckminster Brown, of Boston, was reported. This case was perfectly cured, with perfect motion, without shortening. It was treated in bed for two years by extension and great care in manipulation.

FIG. 5.

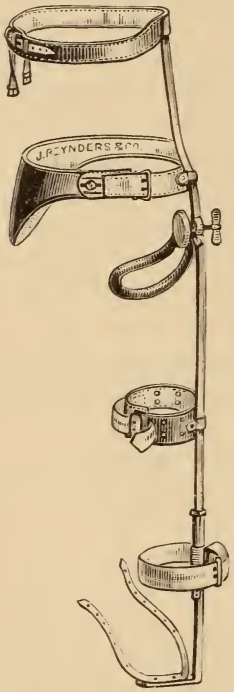
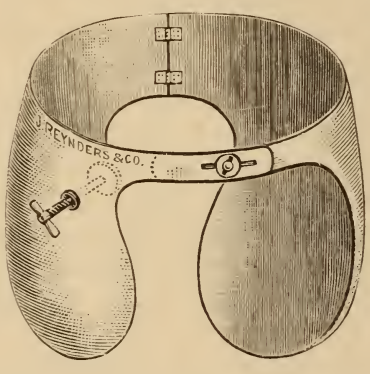


FIG. 6.



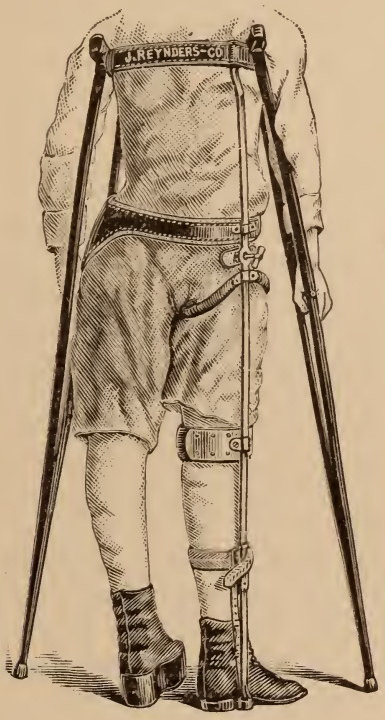
The French have long treated their cases in bed, and have reported very good results. They have also devised very ingenious appliances for making extension and still allowing their patient motion of the hip-joint. After the patients have been treated for a length of time in bed, they are allowed to exercise in a wheel-chair.

Adams improved upon this method of long confinement in bed by

devising a bed in which extension could properly be applied and the limbs held in the normal position. In this the patients could be carried into the open air daily. This is simply a form of portable bed.

Sayre and Taylor, in fact nearly all of the American orthopedic surgeons, have treated such cases with the long traction hip-splint,

Fig. 7.



but I must say, judging from my own observations and those of others, that the results of this plan of treatment have been most unsatisfactory. The patient would wear the splint for years, and when removed there would either be a relapse, or one limb would be found to be considerably shorter than its fellow.

I believe that the treatment of congenital dislocation of the hip should be divided into three stages :

1. The period in bed.

2. The period with the long fixation splint with a lateral-pressure screw. (See Fig. 5.)

3. The period with the walking-splint.

The length of the period of bed-treatment should be until the limb is drawn down to the length of its fellow, if possible. During this treatment by extension the patient is put into steel breeches (see Fig. 6), which have a lateral-pressure screw fitted to a pad which makes pressure over the great trochanter; the object being to excite a certain amount of irritation which will result in the growth of new tissue around the head of the bone.

After the limb has been drawn down to its normal length, which will take usually from two to six months, the patient is put on crutches, with a high shoe and a fixation splint with lateral pressure, as seen in Figs. 5, 7.

The patient is never allowed, during this stage of treatment, to step upon the brace, but after a year or a year and a half the upper part of the brace is cut off, the high shoe is lowered, and the patient allowed to walk upon the splint.

Small children I treat with the plaster-of-Paris portable bed.

DISCUSSION.

Dr. Henry Ling Taylor, of New York, said that there were at least two classes of congenital luxations at the hip, viz., those in which the luxation is produced at the time of labor, and those in which the condition is caused by an arrest of the growth of the acetabulum. He had had a case in which the luxation was unilateral, and in which there was a history of version and forcible delivery by traction on the luxated extremity. About six years ago he had presented to the New York Pathological Society a specimen of congenital dislocation which he had removed from a midde-aged man. In this case, not only were the acetabula shallow and narrow, but the entire pelvis was very light, and portions of the bones were as thin as an eggshell. Beside these, there was a fissure of the sacrum, giving additional evidence of the imperfect development of the whole pelvis.

Dr. N. M. Shaffer, of New York, had had two cases of unilateral congenital dislocation in children, which he had treated by the straight traction splint until the maximum amount of lengthening had been obtained, when a modified apparatus with a joint at the knee and a perineal support was employed. The best result had been obtained in a case which he had seen with Dr. Sands, and in which an attempt was made under ether to reduce the dislocation. After using considerable force this plan of reduction was found not to be feasible, but the manipulation produced, so to speak, an adhesive inflammation which was beneficial, and at the end of two years there was only about half an inch of shortening and a very firm joint.

Dr. Charles C. Foster, of Cambridge, said that the best recorded result had been obtained in the case treated by Dr. Brown. He had assisted in the treatment of that case, and could speak very positively of the great amount of faithful, patient work which had been required to bring about this result. The child belonged to a family a number of whose members had loose joints. The femur could be rubbed all over the pelvis, and there was an acetabulum so slight as to be almost inappreciable. The child was put to bed and pressure applied to keep the bone in the acetabulum, and then by an arrangement of straps the limb was exercised in this position several times every day. As soon as there was evidence of deepening of the acetabulum these exercises were modified. No splint was used at any time, but when the child was removed from bed it was placed in a sort of go-cart, supported on a saddle, so that it could be allowed very gradually to bear more and more weight upon the foot.

Dr. Samuel Ketch, of New York, said that about two years ago he reported in Keating's *Encyclopædia of the Diseases of Children*, about fifty-six cases of congenital dislocation of various joints, discussing in succession the bearing upon this condition of heredity, parturition, location, and treatment. Heredity did not appear to be an etiological factor. The vast majority of labors in these cases were absolutely normal, showing the fallacy of the old idea advocated by Mr. Brodhurst concerning parturition as a cause. In this collection of cases there were no anterior dislocations. He had been

unable to determine whether these cases were examples of simple malformation or of lack of development. One case was very remarkable, inasmuch as it was an instance of congenital dislocation of almost every joint in the body. In this boy there were decided evidences of rickets. Regarding mechanical treatment, he was of the opinion that our chief aim should be to improve the gait, and secure a new position for the head of the bone giving greater length to the extremity. An ordinary long traction splint with the addition of a pad and surcingle to hold the head of the bone in position will prove satisfactory in most cases.

Dr. Albert Hoffa, of Würzburg, said that the best that could be obtained by mechanical treatment was to pull down the head of the femur, and so improve the patient's gait. He thought the best results would be obtained by operation. The chief impediment to reduction is the shortening of the muscles running from the pelvis to the leg, owing to the trochanter major being nearer to the iliac crest than in the normal subject. The posterior leg muscles are also shortened. The reduction in adult cases is so difficult that he would not advise attempting operative reduction in patients over eight or ten years of age. In children of from three to six years, the reduction is very easy. After cutting off the joint and separating all the soft parts from the upper end of the femur, it is very easy to pull down the femoral head until it is in the position of the old acetabulum. It is desirable next to enlarge this acetabulum. It has been said that it is impossible to do this, but by reference to the specimen exhibited by Dr. Phelps, it will be seen that the acetabulum is the thickest part of the pelvis, and there is no difficulty whatever in making a sufficiently deep acetabulum. In his first operations he used a periosteal flap which he sewed over the trochanter major, but subsequently he found that it was not necessary to make this flap, for, if the cavity be sufficiently deep, there is no danger of the head of the bone coming down. The chief feature of his operation consisted in saving the head, and thereby obtaining a healthy joint. His first operations were performed about two years ago, and about two months since he examined the first case and found a perfectly movable joint and the absence of the awkward gait characteristic of congenital dislocation. Even lordosis was absent. In all of his

cases he had found a rudimentary acetabulum, which was triangular in shape. Some cases had been reported in France in which the site of the acetabulum was occupied by an exostosis, but no such condition had existed in any of his cases.

Dr. Howard Marsh, of London, England, called attention to the statement which had been made concerning the absence of any causal relation between these dislocations and heredity. He did not consider that this remark correctly represented the subject, for, many years ago, he had had a case of congenital dislocation of the hip brought to him whose mother also had the same condition with very free telescopic movement on the pelvic wall. The condition found in the child was exactly similar to that shown in the specimen just presented. The anterior position is the most favorable one because in these cases there is no lordosis, for the lordosis depends upon the extent to which the femur is displaced backward upon the walls of the pelvis. Congenital dislocations should be divided into (1) those in which the bone slips about on the walls of the pelvis, and (2) those in which it is fixed. In the majority of cases it is so fixed, and under these circumstances he did not think operative measures should be undertaken. Such measures were more properly applicable to cases where the head of the femur is high up and movable.

Dr. John Ridlon, of New York, had had an opportunity of seeing one of Dr. Phelps's cases. He had also had two cases of this condition in his own practice, and he desired to direct attention to the uselessness of mechanical treatment. Dr. Brown's case was a posterior one and the result was good, and this was what might be expected. In his own first case, after the use of traction by the Taylor splint in bed for a year, until the shortening had been reduced, on placing the head of the bone over the acetabulum the entire limb was rotated inward about 90 degrees. In the process of growth from birth to the age of eleven years a distortion of the neck had occurred, and, therefore, simply replacing the bone only resulted in placing the feet at right angles—a worse condition than at the beginning. In these cases mechanical treatment is obviously of no benefit. He thought anterior dislocations more hopeless than posterior ones under mechanical treatment.

Dr. R. H. Sayre, of New York, had had a case of dislocation on the dorsum of the ilium. Here he had brought down the head on to the acetabulum, but it now had a tendency to become a pubic dislocation. He uses an instrument similar to the long traction splint, but with a joint at the pelvis, so that the head can, if desired, make movements at the hip-joint with the idea of assisting in creating a new acetabulum. He thought with Dr. Foster that a grinding motion is an important factor in securing such a result, provided the head of the bone could be retained in the proper position. The iron ring in Dr. Phelps's apparatus he did not think would prove as good in practice as a strap, which could be removed from time to time. The cases in which the bone remained in a fixed position were best let alone.

Dr. E. H. Bradford, of Boston, referred to a case which he had reported on a previous occasion in which he had been using a very light portable splint, which he desired to exhibit to the Association.

Dr. De Forest Willard, of Philadelphia, considered the movable cases the most hopeful ones for operation. In cases where there is slight movement it is better to combine operative and mechanical treatment, beginning first with rather forcible attempts at reduction in order to produce inflammation, and then making continuous horizontal traction, as well as employing systematic exercises with the idea of exciting sufficient inflammation to hold it in place. Lastly came the use of a retaining splint.

Dr. L. A. Weigel, of Rochester, during the past two years had seen three cases of congenital misplacement, two of them being unilateral, and in all of them, by simple traction upon the leg, the limb could be brought down to the normal length, and there was a perceptible play on striking the rudimentary acetabulum. In some cases the muscles on the affected side were rather imperfectly developed. He did not think that in old cases the shortening could be overcome.

Dr. Phelps, in closing the discussion, said, regarding the etiology, he had traced cases and had found that heredity appeared to play an

important part. After his splint has been worn for a year the upper part of it is removed to allow of motion, and the patient walks upon it, discarding the crutches. The vast majority of the cases he believed were really dislocations *in utero* or at birth with subsequent non-development of the acetabulum, and not congenital non-development of the acetabulum allowing of misplacement of the head of the femur, as has been taught and still is believed by a large portion of the profession. The pathological specimen presented appeared to confirm that idea.

TREATMENT OF PARAPLEGIA OF POTT'S DISEASE.

By E. G. BRACKETT, M.D.,
BOSTON.

It is well understood that the paralysis in Pott's disease may usually be expected to disappear in the course of several weeks, or a few months, and therefore its appearance gives no particular reason for alarm. Only very rarely is it permanent, but occasionally it persists for many months, and in these cases the question of the method of treatment becomes of decided importance; perhaps more so of late, since the operative procedures have been advocated, and in some instances have been followed by favorable results. After several months of waiting the tendency is to resort to some radical means; and it is important, therefore, to decide if there is any limit where the expectant treatment should be abandoned, and the operative measures attempted. It is a fair rule to make, that when the operation involves destruction or particular risk, it should not be adopted except for some decided benefit not to be obtained by the less severe but slower means; and when the question involves an operation of this severity, the fair trial of the other methods should surely be given. In this paper are to be considered a few of the points of the expectant treatment, and the duration after which this may be carried on with hope.

The value of rest in these cases will probably be acknowledged by everyone. The condition itself requires it, and the indications point strongly to it; but simple rest is apparently not always sufficient. The paralysis usually appears at a time when the bone disease is in an active stage, when the greatest possible relief from any irritation to the diseased vertebræ is essential, and this will be accomplished by—in addition to the fixation of the back—the entire relief from intra-articular pressure; in fact, the carrying out, as com-

pletely as possible, the usual principles of the treatment in spinal caries. In dorsal caries, and particularly when a knuckle has formed, the effect of dorsal decubitus is toward the separation of the vertebral bodies. If to this force is added that of extension on the spine, whatever is beneficial in this theory is increased, and that this should give favorable results is to be expected from our present knowledge of the pathology of the condition. If due to the meningeal thickening, as a result of the original bone inflammatory process, as we know it often is, the method allows of the most favorable condition for the quieting of the disease, and the absorption of the inflammatory exudation in the meninges. Or if due to the impaired circulation from the inflammatory exudation, then also this method of treatment is best calculated to aid in the restoration of the usual flow of blood.

As illustrative of this treatment, the results with the following cases are taken, not only to show the effect of the method, but also as a consideration of the duration of the paraplegia while the hope of recovery may be entertained. The details of the course of these cases will not be here entered into, but such of the history as is necessary to illustrate this part of the subject.

The first of these represents an ordinary case of paraplegia, perhaps more pronounced than usual, and with incontinence of urine, but no disturbance of sensation. At the time of the beginning of the treatment the condition had existed five months without change. For five months the child was kept at rest in bed, the condition still remaining unchanged. At this time, after being kept lying on the face for a fortnight, the child was put on a frame on the back, with extension to the head and feet. In fifteen days a slight movement in the legs had appeared. From this time the improvement continued steadily; but, unfortunately, at the end of six weeks the patient passed from observation. Therefore the illustration of this case is only of the improvement following so closely upon the beginning of the change in treatment.

The second case is of a slowly developing paralysis in a mid-dorsal caries of some years' standing, with a large, slowly increasing knuckle. The duration of the paralysis was three months. It was complete, sensation was not affected, but the rectum was involved. There was also frequent spasmodic contraction of the legs, which

gave rise to considerable pain. The treatment by rest on the back, with extension to the head and feet, was begun at once. At the end of a fortnight a slight improvement in the legs was noted, but this improvement was continued for a short time only, and from this time until the end of five months no further change occurred, when again an improvement was apparent. At this time the weight was removed from one leg, and soon after from the other. But from the time of the reappearance of the improvement it pursued a continuous course, and in three months the motion had well developed. A brace and head support were fitted, and the patient allowed to sit up for short time daily, and at the end of four months she could walk alone.

The third case[1] is of an adult, in whom the paralysis appeared slowly after about a year of the vertebral disease, which was located in the mid-dorsal region. The knuckle was small. The paralysis appeared slowly, was not complete, but there was some impairment of sensation. For two months she was kept in bed; at the end of which time she had nearly or quite recovered the use of the limbs, and she was allowed to get up, wearing a spinal support. In about two or three weeks the paralysis reappeared, although it was not at any time complete. The rest in bed with extension was at once applied, and in the course of a few days or a week there was an improvement in the condition for the next two months and a half.

At several times, when considerable improvement had occurred, the extension was reduced or removed, but each time followed by a return of the paralytic symptoms. At the end of this period the condition was about the same as at the beginning. From this time the treatment of fixation with extension was rapidly carried out without intermission until the use of the limbs seemed well established. Under this the improvement was steady, and there were no remissions.

The fourth case is of a boy aged eleven years, with a large knuckle in the upper dorsal region. The disease was of some five or six years' standing, and at the time of the appearance of the paralysis there had been some symptoms of active disease. The paraplegia was about two months in developing, was complete, and

[1] For the privilege of reporting this case I am indebted to Dr. H. L. Burrell.

sensation involved. This condition had remained unchanged for eighteen months when he came under treatment. The reflexes were excessive, and there were frequent painful spasmodic contractions of the legs. The treatment by fixation on a frame, with extension to the head and feet, was adopted. The subsequent history is simply of the slow but steady disappearance of the symptoms. In four weeks there was motion in the feet, and enough in the legs to raise the knees from the bed a few inches. Sensation had not changed. In three weeks more the motion had not only increased in amount but also in precision, and the spasmodic contractions were less frequent. In two weeks more these had disappeared, the knee-jerks were less active, and sensation had begun to improve. The weights at this time were reduced to two pounds. At the end of two weeks the movements were free and made with precision. Sensation was normal and the knee-jerks still less active. The patient now began to sit up daily for a short time, wearing a brace and head-support. There was no interruption to the continued improvement, and in a month he was able to walk.

These illustrate a few points in the treatment of this condition which are of practical value. In the first place: that the hope of recovery may be entertained even after a complete paralysis has existed for many months. In one of these it had persisted for a year and a half.

The employment of extension, particularly to both the head and feet, is frequently followed by gratifying results. In two of these, when added to the treatment which had been carried out for several months, the improvement began within two to three weeks. This improvement does not always follow immediately, although we may usually look for its appearance early in the course of the treatment.

Another very important point is the necessity, as shown in the third case, of continuing the strict recumbency until the course of the recovery is well established. In this case the loss of power in in the legs increased when the weight was removed, and again diminished when renewed, so many times that it was more than coincidence, and when it was continued until the full return of motion there was no remission, but the improvement was steady.

There is one other point illustrated in the second case, and that is, that after improvement to a certain extent, and where the condition

remains stationary for a long time, and the general physical condition shows signs of suffering by the close confinement, it is better to allow them to sit up with a well-fitting spinal support, and this seems to initiate another period of improvement. Too great care cannot be taken in the detail. It is not sufficient that the patient should be on his back, with a weight at the head and feet. The surface of the bed should be smooth, with uniform resistance, so that it does not hollow under the patient's weight. The patient should be on a frame to enable all necessary movements without interfering with the principle of fixation, and the pads should be so arranged as to give even support to the back. Particularly is this necessary in the lumbar region, otherwise the weight is borne on the hips and the knuckle, and tends to make an unnatural curve.

It is very important that the rest should be persisted in, not only until all evidence of active disease has disappeared, but until the return of the use of the limb is well established.

Our conclusions are, therefore:

That in paralysis occurring in dorsal caries, recovery may be looked for even after its persistence for at least a year and a half, and with sensation as well as motion affected.

That the treatment of extension in addition to the fixation is often attended by decided improvement, and should be given a thorough trial before resorting to other means.

That the improvement, although usually early seen, may not be apparent for several weeks or a few months.

That the most careful attention should be given to the details in securing a well-adapted support to the whole back, the continued and even extension, and the avoidance, as far as possible, of all motion.

ON PRESSURE MYELITIS IN POTT'S DISEASE.

By ALBERT HOFFA, M.D.,
WURZBURG, GERMANY.

I WISH to call your attention for a few minutes to the so-called pressure myelitis in Pott's disease. I say so-called, because the microscopical researches of the past few years show that there is not at all a regular inflammation of the spinal cord. Let me explain in a few words our present knowledge of the pathological anatomy of the alteration of the spinal cord in Pott's disease.

When the tubercular growths in the body of a vertebra have caused a perforation at the posterior surface of the vertebra and a destruction of the periosteum of this surface, then the tuberculous inflammation begins to spread in the *epidural* space, which favors the tuberculous growths, because of its loose, fatty, and vascular tissue. In this way partly tubercular granulations, partly tubercular abscesses, press the dura mater upon the cord. Now reaction takes place in the dura, but a specific inflammation of this membrane does not yet occur. The process still remains a peri-pachymeningitis. It is only after the process has lasted for some time that the peri-pachymeningitis becomes pachymeningitis. But even then the process is limited for a long time to the outer layers only of the dura mater. If the patient lives long enough, the process finally passes through the dura, and then assumes the characteristics of a typical tuberculous inflammation of the cord. Thus this specific tuberculous myelitis never sets in until near the end of the disease, to which the patient succumbs.

It cannot be the prime cause of the paralysis, for this occurs much earlier as the result of two other factors which act injuriously upon the spinal cord, namely, the pressure on the cord, and an œdema of its substance.

Very soon after the invasion of the epidural space by the tubercular process the cord begins to show functional disturbance as the result of the advance of the morbid process. This functional disturbance may sooner or later pass over into complete paralysis. The first functional disturbances are doubtless caused by the pressure of the cord from the tubercular growths. That it is the pressure of the exudation on the cord which causes the functional disorders is clearly proved by the fact that in such cases a distinct flattening of the cord is found post-mortem.

In addition to the pressure of the cord there is another factor at work, namely, an œdema of the cord. This is due to the fact that the pressure of the tubercular exudation upon the coverings of the cord causes an interference with the flow of the lymph from the cord and a stasis of the tissue fluids therein. After this solid œdema has existed for some time the lymphatic fluid acts like a poison upon the nervous elements of the cord. This first increases and then decreases in such a way that often open spaces are left in the meshes of the neuroglia. Thus a *softening* of the cord arises. But at the same time there is a hypertrophy of the interstitial connective tissue of the cord, so that finally complete sclerosis takes place.

I here take the liberty of presenting some of my microscopical preparations, illustrating very clearly what I have just said. The tuberculous process acts in the same way upon the spinal nerves as upon the cord. There is first a peri-neuritis and then an œdema of the nervous tissue, which leads to atrophy of the nerves.

Now a few words regarding the treatment of the paralysis. When we recognize the pressure of the exudate in the epidural space, which is the prime cause of the paralysis, we must direct our energies to confining this exudation to the narrowest possible limits. As we obtain the least possible exudation in a tuberculous knee-joint when we keep this joint in fixed extension, so we obtain the best results in tuberculous inflammation of the spinal column when we keep the spine absolutely at rest.

In recent times attempts have been made to cure the spondylitic paralysis by operative measures, namely, by trephining the spinal column and by grattage of the affected portions of the vertebræ.

After what we have said it will be seen that these attempts rest upon a rational basis. If it is possible to remove the tuberculous

granulations before they have invaded the cord, then we shall be able to prevent the pressure on the cord and the œdema of its substance. Unfortunately, however, the operation itself is of very limited application. It is almost impossible for us to reach the epidural space and remove therefrom all diseased tissue. This, however, is the prime object which we must have in view in performing the operation.

Up to the present time, indeed, the results of the operation have been discouraging. I have collected thirteen operations of this nature, four of which through shock or hemorrhage ended in death immediately after the operation. Two only are reported as cured. Of the remainder, the immediate results were often most surprising, as improvement was noted in cases of even very severe paralysis. But this improvement was only temporary. The paralysis returned completely, because the tuberculous exudation again took place after a few months. In regard to those cases which were reported as cured, we must remember that even very severe paralysis may improve of itself without operation, and after many years' duration.

I think, therefore, that the operative treatment of the paralysis in Pott's disease has no great future before it.

The operation should be limited to those cases in which the tubercular process has invaded, not the bodies, but the processes of the vertebræ. In the last-mentioned cases we might look for very good results from operation, since we are then enabled easily to reach the seat of the tuberculous lesion.

DISCUSSION.

Dr. H. L. Taylor said that he had nothing new to offer beside what was contained in an analysis of fifty-nine cases which had been published by Dr. Lovett and himself in June, 1886.[1] Thirty-nine out of forty-seven cases, where the termination was known, recovered entirely; three recovered partially, five died of intercurrent affections. In two of the fatal cases the paralysis was improving at the time of death, and in two others it was *probably* cured at this time, but they were not included with the others, as their exact condition was not ascertained. Out of seventeen cases where the paralysis

[1] The Medical Record, June 19, 1886.

began while the patient was receiving protective treatment, and whose termination was known, all recovered completely.

The opinion was advanced that the paraplegia was due, in the large majority of cases, to the pressure of exudation.

Dr. E. H. Bradford, of Boston, referring to Dr. Hoffa's paper, said that in a case which he has seen of Pott's disease with marked kyphosis, there had been two attacks separated by an interval of about one year. On a third occasion he became in one week completely paralyzed, but about this time he was attacked with measles, and two days later the child had entirely recovered and was able to walk. It was too young to be considered as a hysterical affection, and the symptoms were like those of the preceding attacks. There was no history of paralysis during the two years following. At this time he died of acute pneumonia. The speaker said that he had been unable to find such a case on record. A possible explanation might be found by supposing that the œdema had been somewhat diminished by the intercurrent disease.

Dr. Shaffer referred to a case of Pott's disease occurring in a patient, thirty years of age, in his service at St. Luke's Hospital in 1878. At the autopsy a portion of the eighth dorsal vertebra was found impinging directly upon the cord, through which it had so nearly cut its way that only a slender thread remained.

Dr. J. K. Young, of Philadelphia, said that the absence of sensation in these cases had always been looked upon as of grave import, yet he had reported two cases in the *University Medical Magazine* in 1888, in which recovery occurred. In both cases there was complete loss of sensation in both lower limbs. Under careful treatment, conducted in one case by Dr. Mitchell, of Philadelphia, and later by Dr. Roberts and himself, complete recovery occurred in both cases. We should distinguish between the class of cases referred to by Dr. Hoffa and those directly due to pressure. The latter occur more suddenly, and are more grave; the former cases, in his experience, all recover.

Dr. Ketch said that he believed he had at present under observation a case in which the paralysis remains after all acute symptoms

have subsided for at least two years. The paralysis had lasted nearly five years. Even now he did not wholly despair of his patient recovering, as he held very hopeful views of these cases. Mechanical treatment has been kept up.

Dr. Ryan was aware that it was the practice of many orthopedic surgeons to keep up mechanical treatment for years after every symptom of bone disease had disappeared. If the pathology given this morning be correct, there could be no advantage in keeping up fixation. He is at present treating two cases of paraplegia, one of two and one of three years' standing, where the Pott's disease has wholly subsided, and his treatment consists in rest on the back without any splint. There could be no traction made where consolidation had taken place, fixation only being made, and Nature had already accomplished this.

Dr. Arthur Gillette, of St. Paul, remarked that ankle-clonus was considered by some neurologists as an unfavorable sign.

Dr. R. H. Sayre had often seen ankle-clonus present in cases which had subsequently recovered. In one case, which had received long and varied medicinal treatment without avail, and which had been abandoned, spontaneous recovery ensued. The bone disease had ceased to progress, and there was a simple curve of the spine with marked deformity. The reflexes were so exaggerated that a step upon the floor was sufficient to excite a violent trembling of the limb. Many of these would be improved if kept in bed for a long time.

Dr. Shaffer said that where the motor tract was alone involved, the prognosis was invariably good, but as the posterior columns become involved, giving us practically a transverse myelitis, the prognosis should be very guarded, and hence the grave significance of bladder symptoms, no matter how slight. So long as the patellar reflex was present the outlook was good, even with marked anæsthesia.

Dr. Hoffa, referring to Dr. Ketch's case, said that he would expect to find an abscess pressing upon the cord. Such cases had been reported.

Dr. Ketch knew of no reason whereby such an inference could be drawn from the symptoms, as there were absolutely no symptoms of abscess.

ABSCESSES IN POTT'S DISEASE.

By HERBERT L. BURRELL, M.D.,
BOSTON.

In this paper I shall limit myself to certain points in the course and treatment of Pott's abscesses that have occurred to me. An abscess appearing in the course of the treatment of a case of spinal caries, is one of those incidents that may be considered as a conservative act of Nature in ridding itself of the detritus of a destructive process in the bodies of the vertebræ.

The symptoms vary according to the location of the abscess. With all cases there are at first associated a rise in temperature more or less persistent, loss of flesh, and particular individual symptoms according to the anatomical structure involved—for instance, dyspnœa or dysphagia in retro-pharyngeal abscesses; respiratory symptoms in cervical abscess; pulmonary symptoms in upper dorsal caries; and in lower dorsal and lumbar abscesses, symptoms are developed according to the viscera pressed upon or involved. For the early recognition of abscesses I have come to depend largely upon a continued loss of appetite, loss of flesh, and continued elevation of temperature; in fact, when a child has been efficiently treated by mechanical support for the spinal caries, and for some reason is not gaining in general health, one may suspect that there is an abscess forming. In the adult, however, these symptoms are not common. Here the course of abscesses connected with spinal caries is quite different. One of the most remarkable things is the quantity of pus that may collect in a psoas abscess in an apparently healthy adult, who has but little intimation that there is spinal caries; perhaps all that has been noticed has been persistent lumbago until the patient is brought to the surgeon, who finds that the iliac fossa is filled with a resistant

mass, the thigh slightly flexed and enlarged, from the passage downward of the pus along the course of the psoas and iliacus muscles.

I have, in fact, come to regard spinal caries in an adult as essentially a different disease from that which occurs in a child. In adults the following group of symptoms is not at all uncommon: For a few months the patient has noticed some slight, persistent, local pain in the back, which is thought to be rheumatism. He experiences a sensation of general debility; there is slight loss of appetite, but he continues about his occupation, frequently a very laborious one, with progressive loss of flesh and persistent elevation of temperature. On physical examination no deformity in the spine can be determined, and occasionally, especially in the lumbar region, there is only slight spasm of the erector spinæ muscles; but in the iliac fossa, and down on the thigh, one may notice a large collection of pus. It is true that we may have spinal caries in a child appear very insidiously; but in an adult it is the rule rather than the exception.

Although the appearance of an abscess in Pott's disease may be considered simply an incident of the disease, yet it is a very serious affair unless it is properly treated, and in many of our patients, in spite of all our care, it is the beginning of the end; for when an abscess opens, and sepsis occurs, unless great care is taken a fatal ending is inevitable.

The pertinent question in regard to all abscesses connected with spinal caries is: What shall be done with them? Shall they be left alone, and if so, how long? Shall they be opened, and if so, when? Formerly, as we know, these abscesses were left alone, because the mortality attending their opening was very great, but in later years we have come to regard the opening of abscesses in Pott's disease as a proper procedure under certain circumstances—and these circumstances I shall attempt to define. The surgical axiom, that wherever pus is found it should be evacuated, is not in this instance literally true, since we are all familiar with cases of abscesses in Pott's disease, that, left to themselves, and under careful mechanical and hygienic management, have in course of time become absorbed. It is true that reasoning from an individual case is, as a rule, dangerous, but I wish to relate one case that illustrates the expectant treatment of an abscess.

In 1884, an adult, J. D., twenty-four years of age, a bank-clerk

in Somerville, was seen; he had been treated for a year or more for lumbago and rheumatism, but a few weeks previously he had noticed that his right thigh was enlarged and the limb flexed. He called the attention of his family physician to this, and I was asked to see the patient. On examination I found slight tenderness over the last dorsal and first lumbar vertebræ. The concavity of the right iliac fossa was filled with a dense, indistinctly fluctuating tumor. The right thigh, an inch below the groin, was six inches larger than the left, and was occupied by a fluctuating tumor. The patient had lost some flesh, though his appetite was excellent, but he had been progressively growing worse. His condition having been explained to him, he concluded to try an efficient mechanical support for his back, and to temporize in the treatment of the abscess. A Taylor back-brace was adjusted, and the patient was instructed how to bandage the thigh with a flannel bandage to prevent the extension of the pus.

I saw this patient at various intervals during the next two years, and at the end of that time I could not detect any perceptible enlargement of the right thigh. Four years later there remained some thickening in the right iliac fossa, but the abscess had apparently been completely absorbed. At the present time he is engaged in his occupation, strong, and apparently perfectly well.

This is a case showing what can be done by expectancy. I could cite numerous instances of conditions practically similar in children that were strong and healthy, and not of a marked tuberculous diathesis, in which absorption of the abscess had occurred.

Bearing upon expectancy is the fact that these abscesses are often of long standing—that is, five, six or seven years may have elapsed since the beginning of the carious process; and the more quiescent the carious process, the better the result that may be expected from an operation.

Efficient mechanical support of the spine will in a great many cases unquestionably avoid the necessity for operative interference. My own feeling in regard to the matter is, that until some failure begins in the patient's general condition, no operation should be thought of just so long as the patient is improving under efficient mechanical support to the spine, unless the abscess is extending in such a way that it is involving important parts—for instance, in the spine, the cord; in the thorax, the lung.

It seems to me far better to temporize until we feel assured that the abscess will not be cared for by absorption; and, again, when we do interfere, I believe in interfering most radically and efficiently; for the danger of interference in psoas abscesses is unquestionably from sepsis, and if we drain efficiently and thoroughly, and keep our wound free from septic contamination, we shall in the vast majority of cases have favorable results.

Aspiration of the abscess is an uncertain measure, for it rarely evacuates the abscess completely, because of plugging of the needle. It should be reserved for those few instances in which temporizing is being carried out, and relief to tension of the abscess is thought necessary.

The treatment by injection of the abscess-cavity after aspiration is uncertain, and when active germicides are used there is danger of systemic poisoning.

The ordinary psoas abscess, as it presents itself, forms a tumor in the iliac fossa and in the upper part of the thigh, and when expectancy has been tried and is of no further avail, I carefully prepare the patient for operation by accurately fitting a Taylor brace, or by recumbency in bed for a week or ten days. I have found this tend to limit the size of the abscess and to render it more readily drainable. After aspiration, to exclude the possibility of aneurism or solid tumor, a free incision, just external to the femoral vessels, is made into the substance of the presenting tumor. This is usually associated with the discharge of a large quantity of pus. An incision is then made into the most prominent portion of the swelling in the iliac fossa, care being taken that the peritoneum is avoided when one reaches the transversalis fascia and the subperitoneal fat. From this point a block-tin sound is passed as far as may be up into the abscess-track toward the spine. Direct drainage is then obtained by carefully dissecting down on the outer edge of the quadratus lumborum to the distended psoas and iliacus sheath. Usually these three openings are necessary in order to efficiently deal with the tuberculous material lining the abscess-wall. A curette and flushing are used freely, and large drainage-tubes are placed in such positions that they will efficiently drain the cavity. The incision in the iliac fossa is frequently closed by suture. Occasionally the incision into the anterior upper portion of the thigh is closed by suture, but rarely have I diminished

the size of the opening which is made in the loin, from the fact that from this opening I hope to obtain direct drainage of the abscess from as near its source as is practicable. Of course, the fingers are introduced into the opening through the loin, and if any loose fragments of necrotic bone can be felt they are removed.

If the patient has a double psoas abscess I deal with both in the same manner, especially if they occur in an adult; because I have found that with double psoas abscesses it is better to drain both sides efficiently than to attempt to drain one side first and then the other; for, if only one side is drained, a large reservoir of pus may be left, which communicates through a small opening with the side drained, and this collection of pus is occasionally the source of systemic poisoning. If a psoas abscess is efficiently drained, the quantity of pus discharged will diminish from day to day, and, according to the size and extent of the spinal carious process, will gradually cease in a varying time.

No more depressing picture can be presented to a surgeon than to see a psoas abscess that he has opened become septic, and the patient gradually develop septicæmia and die from that cause. Hence, for success in dealing with these abscesses, the most rigid antisepsis is absolutely essential.

Those unique abscesses that for some reason do not follow the usual course, of descending in the sheath of the psoas muscle, but point posteriorly at some point on the back, are likewise dealt with by free incisions at their most prominent part, by efficient flushing, and thorough curetting.

Retro-pharyngeal abscesses, which are rare, form a group by themselves. I have seen only six, and two have been fatal. In both instances death occurred from bursting of the abscess and flooding of the lungs. Usually on introducing the finger into the posterior wall of the pharynx one can feel an elastic swelling, which may be incised by a suitably guarded knife introduced into the median line of the posterior wall of the pharynx. The "Roser position" of the head, that is, the head dependent over the end of a table, is by all odds the best, as, with a suitable mouth-gag, it gives complete and efficient control of the mouth of the patient, and the discharge of pus that takes place. With the patient in this position and efficiently held by assistants, one does not have to make a plunge in the dark, so to

speak, but can thoroughly open the mouth, and can make a free incision directly into the apex of the tumor, and the discharge of pus will take place through the mouth and nostrils, and there will be no danger of suffocation from the pus entering the respiratory tract.

In the last two cases of retro-pharyngeal abscesses that I have had to deal with I made a direct incision just posterior to the right sterno-cleido-mastoid, dissecting down deliberately until I came in contact with the sheath of the main vessels of the neck. Holding these anteriorly I then entered a director or blunt probe, carefully separating the structures until I tapped the abscess laterally. In this manner I was in one instance enabled to keep the abscess sweet from beginning to end; in the other, unfortunately, the child was moribund at the time of attempting the operative interference, and my efforts were unavailing. This is a measure seemingly worthy of attention, and has been the subject of investigation by one Russian authority.

It is true that the operation for a Pott's abscess is a matter of consequence, but the dressing is of equal importance. I have come to use baked gauze, the inner layers of which are saturated with 1 : 2000 solution of corrosive sublimate, applied directly in contact with the various incisions that have been made. Over this is placed a large quantity of dry baked gauze; and I have found that assistants err in putting on too small a dressing. If it is a psoas abscess it is held in position by an efficient gauze spica-bandage. In all children great care should be taken to protect the dressing by putting on a mackintosh or oil-silk to prevent soiling by urine or feces. Usually, within twelve hours, this dressing must be changed—for, from a cavity as large as the average psoas abscess, an enormous quantity of sanious fluid drains away and saturates the dressing. When treated by this method the subsequent dressings remain sweet and clean for from a week to ten days at a time.

In abscesses that point in other regions than along the course of the psoas and iliac muscles—for instance on the back, where it is impossible to get directly to the bottom of the channel of pus—the cavity is tamponed with antiseptic gauze. In a retro-pharyngeal abscess when an incision is made directly behind the sterno-mastoid muscle, and the abscess-cavity is drained through this channel, a suitably-

sized drainage-tube is placed in the wound, the remainder being held open by antiseptic gauze. This wound should be dressed once in twelve hours, owing to the liability of pus to collect in small pockets, and to prevent any possibility of pressure being made on the important structures of the neck. This measure should be carried out for two or three days.

In prognosis of psoas abscesses there is an important distinction to be made between abscesses occurring early and late in the disease. In those early or *acute* abscesses that come on within the first few months of a caries of the spine, and that are associated with marked constitutional disturbance, the prognosis is not so favorable as in the late or *chronic* abscesses that occur in the disease at the end of two, three, or more years after the beginning of the carious process.

In acute abscesses the patient frequently succumbs to the disease in spite of all our tentative or operative efforts, whereas in chronic abscesses their evacuation by efficient drainage is simply an incident in the course of the disease.

Quite a large proportion of the cases that I have operated on for abscess in Pott's disease have recovered completely, but after a long period of time. There frequently persists for weeks and months, and in certain instances for years, a sinus, out of which is discharged a slight quantity of pus or straw-colored fluid. Frequently the mistake is made of leaving off the antiseptic dressing when the wound is reduced to this sinus, but it should be continued until all discharge has ceased. The drainage-tube should be retained until practically all of the tuberculous material has been discharged, although occasionally I feel that the tube is retained too long.

From my personal experience the following conclusions are warranted:

1. That efficient mechanical support of the spine is the prime factor in the treatment of caries of the spine associated with an abscess.

2. That under an expectant plan of treatment, the abscess will in many cases disappear.

3. That the indication for operative interference is a steady or rapid decline in the patient's general condition.

4. That the operation should consist in thorough evacuation of the abscess, and the establishment of drainage from as near the seat of the disease as is practicable.

THE TREATMENT OF ABSCESSES OF POTT'S DISEASE.

By W. R. TOWNSEND, M.D.,
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The proper treatment of the various complications of any disease is a matter of fully as great importance as the treatment of the disease itself, and while opinions vary but little as to how to treat Pott's disease, such is not the case with respect to the abscesses that are such a frequent complication. Some recommend that every abscess be let alone, others that every abscess be opened. To follow blindly either extreme is certainly not good surgery, and with an endeavor to throw some little light upon the subject, I have studied during the past summer the histories of 380 consecutive cases of Pott's disease seen at the Hospital for the Ruptured and Crippled, New York, and in the private practice of Dr. Gibney and myself. In speaking of the cases no distinction is made between hospital cases and those in private practice, as the conditions varied so little. I have purposely omitted complicated cases, as of Pott's disease with hip, or knee, or ankle lesions.

Of the 380 cases, 75 were complicated by abscesses, and as the cases represented all stages of the disease, from the incipient case in which a positive diagnosis was scarcely possible to those that were convalescent and cured, we may say that about one case in five at some time during the disease develops an abscess. These figures vary somewhat from those given by Mohr, quoted by Bradford and Lovett, according to which, in 61 autopsies, there were 30 with abscesses, and in life, of 72 cases, 9 with abscesses. The abscesses were found connected with disease in the cervical region in 8 per cent. of the cases, in the dorsal region in 20 per cent., and in the

lumbar region in 72 per cent. of the cases, which figures very closely correspond with those given by Michael and Parker.

We see by the foregoing that the problem most frequently presented to us is the treatment of abscesses connected with the lumbar region, and fully two-thirds of these are either in the pelvis above Poupart's ligament, or pass below the ligament and point in the thigh through Scarpa's triangle—the psoas abscesses.

Of late years the study of bacteriology has largely increased our knowledge of disease processes, and shown that true inflammation is always caused by the presence of one or more kinds of pathogenic microbes. In other words, in acute abscess we find pus-microbes; in a cold abscess, however, such is not the case, and I will quote briefly from Senn, *Principles of Surgery*, page 450. Speaking of tuberculous abscesses, he says: "The effect of the bacillus of tuberculosis on the tissue is to produce a chronic inflammation, which invariably results in the production of granulation tissue. The embryonic cells furnish, as it were, a wall of protection for the surrounding healthy tissue. The characteristic pathological feature of every tuberculous product consists in the tendency of the cells of which it is composed to undergo early degenerative changes, which are caused by local anæmia and the specific chemical action of the ptomaïnes of the tubercle bacilli, and consists in coagulation-necrosis, caseation, and liquefaction of the cheesy material into an emulsion, which has always been regarded as pus, until recent investigations have shown that it is simply the product of retrograde tissue-metamorphosis, and not true pus. I believe that it can now be considered as a settled fact that the bacillus of tuberculosis is not a pyogenic microbe, and that in the absence of other microbes it produces a specific form of inflammation which invariably terminates in the production of granulation tissue, and that when true suppuration takes place in the tuberculous product it occurs in consequence of secondary infection with pus-microbes."

Accepting the pathology as given, the treatment of the abscesses of Pott's disease seems to me more simple than some would have us believe. If the abscesses could be opened, thoroughly cleansed, all tuberculous material removed, any bone-detritus washed away, with no infection of the external tissues, and with perfect asepsis, then those who advocate opening every abscess would clearly have estab-

lished their point; on the other hand, could it be shown that no trouble followed from extreme conservatism, then there would be no necessity for operative procedures. But whilst some cases do well, and the abscess seems in no way to influence the final result, others do badly, and the abscess is undoubtedly the cause of the patient's death. The explanation of these various conditions seems to me to be largely due to the question of infection by the pus-microbes. As long as the tuberculous or cold abscess remains purely such, but little inconvenience may result to the patient and the symptoms are insignificant; but let a mixed or a secondary infection occur, and all is changed—a condition of sepsis is added to one of tuberculosis. If the abscess has never been opened, it is noticed that the child is doing poorly, septic symptoms appear, the temperature is characteristic or at least suggestive, more severe symptoms may follow, and, if nothing is done, death ensues; but let such a case be treated scientifically—remove or do away with the source of infection, secure proper drainage—and improvement will at once be noted. The secondary infection may not occur until some time after the abscess has been opened, or it may occur at the time of opening, and it is the danger and the great frequency of this occurrence that deters us from opening these cold abscesses. We know that despite all possible precautions, and with every endeavor to be strictly and surgically aseptic, the cases become infected, and may die as a result of this infection. If the septic trouble be mild in character it is usually recovered from, but we must remember that the patient is already suffering from tuberculosis, and the conditions are not as favorable as they would otherwise be.

Caseation and absorption of the liquid contents of the abscess are a more frequent result, I believe, than is generally supposed, and this may often be aided by means of aspiration, which, of course, is done with every antiseptic precaution. The operation is often very disappointing, owing to the fact that the needle soon becomes clogged and the abscess is but very imperfectly evacuated. This difficulty can be partly overcome by using a large-sized needle, through which, if the suction-force is good, large pieces of cheesy material may be removed; and a simple expedient that I have found of value when such clogging does occur is to force through your aspiratory needle a small amount of a weak carbolic solution, thus washing back into

the cavity the obstructing plug; then, changing the position of the needle, to begin aspirating again. Introduce the needle at some little distance from the abscess, so that considerable tissue intervenes between the opening and the external air. It is advisable to make the openings also at dependent points, so that if the abscess should eventually open along the track of the needle the drainage will be of the best. If possible, after the evacuation of the abscess, whether or not any fluids, such as iodoform and glycerin, or hydrogen peroxide, etc., have been injected, make pressure either by a pad and bandage, or by straps of adhesive plaster. This prevents hemorrhage from the sac-walls, and promotes absorption. Very little has been done with the injection of fluids into the abscess-cavity after evacuation in the cases here analyzed, as the results by the other method were so good. The iodoform emulsions suggested by Bruns and Krause, seem, however, worthy of trial.

In all cases, no matter at what stage of the disease, efficient protection should be given the spine, either by plaster, paper, wooden or wire jackets, or corsets, or by some of the numerous forms of braces. This protection, combined with proper general care of the patient, will in many cases cause a disappearance of the abscess, and all that remains is a small nodule, without fluctuation, and causing no symptoms. If the abscess is increasing rapidly in size, or is producing pressure symptoms, aspirate, and this should be continued at intervals if the patient is doing well. If the patient is doing poorly, and symptoms indicate this is due to the abscess, endeavor to remove the cause; open, clean out thoroughly, scrape the abscess-cavity, and, if possible, the sinus leading to the diseased bone, and also the diseased bone itself. Secure good drainage, and keep your wound aseptic, if possible. Of the many cases of abscess in the pelvis but few can be properly drained by one opening, and I believe it best to open through and through, so that, standing or lying down, the drainage is always good.

Whether the cheesy mass left behind after non-operative treatment or after aspiration may cause future trouble, is a matter that is not clearly established, although we might reasonably suppose that in some cases it does.

There are also a certain number of cases in which aspiration or incision might be indicated to prevent the abscess bursting into some

viscus, but none have occurred among those analyzed in this paper. The most frequent indications for opening the abscess in non-infected cases that are doing well are that they interfere with the proper application of a brace, or by their size are impediments to locomotion. The psoas abscesses, if accompanied by much contraction of psoas and iliacus muscles, cause marked lameness, which disappears when the abscess is removed. Another reason for aspiration or incision is that, by burrowing, the abscess may enter another joint and cause further trouble.

ANALYSIS OF 75 CASES OF ABSCESSES OF POTT'S DISEASE.

No treatment but brace;	abscess disappeared	3
" " "	abscess *in statu quo*	8
" " "	abscess increasing, child doing well	8
" " "	child not doing well	2
		21

Aspirations.

Abscess disappeared	11	
Abscess opened spontaneously after aspiration failed	3	
Abscess incised after aspiration failed	4	
Abscess *in statu quo* after aspiration failed	1	
		19

No. of aspirations in each case from 2 to 6, average 3.

Incisions—Scraping Sac.

With use of iodoform emulsion or peroxide of hydrogen		14
Results—Good	11	
Bad	3	
Infected at time of operation or at subsequent dressings	11	
Not infected	3	

Opened Spontaneously.

Results—Good	15	
Bad	6	
		21
		75

Deaths.

Tuberculous meningitis	2
Amyloid liver	2
Suppression of urine	1
	5

A study of the preceding analysis will show us that the cases that have been treated on the expectant plan and by aspiration have done remarkably well, and we believe this plan should be followed whenever possible. The two deaths from meningitis occurred in cases that had been aspirated, the two from amyloid liver in cases that had opened spontaneously, and the death from suppression of urine occurred in a child thirty-six hours after opening a psoas abscess in front and behind and inserting a drainage-tube. These results are immediate rather than final, and it must be clearly understood that they do not represent the true death-rate of Pott's disease complicated by abscesses. The death-rate after incision is also larger in adults than in children.

ON THE EVACUATION OF SPINAL ABSCESSES WITHOUT DRAINAGE.

By G. A. WRIGHT, B.A., M.B., Oxon., F.R.C.S.,
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It would be hard to find a surgical problem more difficult to solve than that of the best method of treating abscess arising from tuberculous disease of the spine. There are surgeons who never open a spinal abscess, and trust to one or another mode of treating the carious spine, in the hope of the abscess becoming quiescent or drying up. Others open abscesses only when they are on the point of bursting; others use aspiration, repeated twice, or more often, if the cavity refills; others open without draining by the old valvular incision; others open and drain, without doing more. Others again open and drain after washing out the cavity more or less thoroughly. Some open an abscess where it approaches the surface; others seek it at the nearest accessible point to the bone lesion. Treves, taking a rational view of the condition, sought to remove the cause of the abscess by reaching the carious focus and removing the dead or hopelessly diseased bone. Barker and others have dealt with the abscess-cavity by careful cleansing and removal from it of all caseous and tuberculous material, as far as possible, with an attempt at obliteration of the abscess-cavity by immediate union of its walls. Other methods have also been adopted—hyperdistention of the sac, injections of various kinds, and so on. The very multiplicity of methods shows the inefficiency of any one to meet all cases. The ideal treatment would, of course, be a combination of Treves's and Barker's methods—the removal of the focus of disease to which the abscess is due, together with the removal of the contents and wall of the abscess-cavity. Unfortunately it is only in a very small minority of cases that this is practicable. As a rule, it is quite impossible to

reach and clear away the carious focus in the spine. On the other hand—as, with efficient treatment, the bone-disease frequently becomes healed and the caseous material is detached and thrown off into the abscess-cavity—we may hope by thorough removal of the contents of that cavity to obtain a good result in a certain proportion of our cases, and this without leaving behind a possible source of future infection, such as after any of the other methods of treatment.

Barker's method must therefore be considered as the most scientific and practical method of dealing with these difficult cases. Failure is due either to the fact that the disease in the spine is progressive, or to imperfection in the operation. The whole of the morbid material may have been removed from the abscess-cavity, and yet more may descend the (usually) narrow track leading from the diseased bone into the wider abscess-sac below. In such cases, even if the abscess has been obliterated after the first operation, it will sooner or later refill. The right treatment in such cases, I believe to be, to repeat the operation, just as in the first instance, and I would not hesitate to repeat it a third time, or oftener, if necessary. Therefore, if after the first operation a sinus forms and persists, it should be carefully scraped out again as soon as it is clear that sound healing will not occur; if left, tuberculous infiltration of the walls of the sinus is likely to take place. I have not entered into a detailed description of the operation; it is sufficient to say that a large opening should be made and the walls of the sac carefully scraped away with Volkmann's spoon or some other instrument, and well rubbed out with artificial sponges or similar material. The cavity should then be well washed out with an antiseptic lotion, and iodoform, in suspension or solution, injected. The excess of fluid should be squeezed out, the wound closed and dressed with firm pressure to keep the walls in contact, and, so far as possible, the cavity obliterated. If all goes well, no change of dressing is required for a week or two, and then, if the case is successful, the wound is found healed.

Mr. Mayo Robson appears to have had considerable success in the treatment of these cases by repeated aspiration and injection solely of iodoform solution, but this cannot be looked upon as so perfect a method as Mr. Barker's, inasmuch as infectious material is far more likely to be left behind. While I believe that the principle of

Barker's operation is the best, an examination of the notes of my cases shows that in most instances it has failed. The failure has been due not apparently to any septic condition, but simply to the fact that, as already pointed out, the whole of the disease has not been removed.

My conclusions as to the treatment of spinal abscesses are:

1. The first essential is *rest*, in its surgical sense, to the spine.

2. When efficient rest has been provided, an abscess, unless it is increasing, should be left to itself for a period of not less than a month.

3. If the abscess increases and is evidently going to open spontaneously, or if there is acute suppuration going on, the abscess should be dealt with by Barker's method, provided thorough asepsis can be assured.

4. An abscess that remains stationary for more than two months, or thereabouts, should be dealt with by Barker's method, provided that throughout the period *rest* to the spine has been secured.

5. Receding abscesses should be left alone.

6. Residual abscesses, if stationary or advancing, should be dealt with by Barker's method, and will nearly certainly be cured.

7. Refilling of an abscess or persistence of a sinus after evacuation should be dealt with by a repetition of the operation so soon as it is evident that repair will not take place, *i. e.*, usually in a month.

8. If there be a doubt about the real maintenance of asepsis, either from want of training on the part of the surgeon or his assistants, nurses, friends, etc., the abscess should either be left alone, or dealt with by aspiration and injection of iodoform.

(I may refer to Mr. Barker's paper, *British Medical Journal*, February 7, 1891; to that of Mr. Mayo Robson, *British Medical Journal*, April 25, 1891; and, in the same number, to some cases of my own bearing on this question.

BILATERAL LUMBAR ABSCESS; WITH A CASE.

By JAMES K. YOUNG, M.D.,
PHILADELPHIA.

The following case illustrates the result of conservative treatment of a very severe bilateral abscess accompanying Pott's disease in a young child.

J. O'B., a male child, aged four years, was referred to me June 28, 1890, by Dr. Wm. E. Hughes. He had been in perfect health until the summer previous, when he fell down one step and struck against a stove. During the autumn succeeding the mother noticed a small projection in the lumbar region, and he complained of pain in the knee. Examination revealed caries of the spine with a projection of the spinous processes of the eleventh and twelfth dorsal and first lumbar vertebræ. A spinal assistant was applied and worn, and internal and local remedies were employed. Subsequently a very large abscess developed on the left side, which was twice aspirated, and still later a smaller one developed on the right side and was allowed to open spontaneously.

Full antiseptic dressings were employed throughout, and at present there is a very small superficial sinus unhealed. The vertebræ are ankylosed, and he now enjoys good health and runs and plays as other children.

The subject of lumbar and iliac abscess has already been so ably discussed before this Society at one of its earlier sessions that in presenting the present case of recovery from severe bilateral abscess it will only be necessary to refer to the seat of the disease and the importance of the fasciæ in determining the course, exit, and prognosis of purulent collections in the lumbar region. It is a well-recognized fact that abscesses in every region of the spine follow a pretty definite course and termination, the direction and exit of the pus being

influenced by the seat of the lesion, and secondly, by the fasciæ and aponeuroses.

Thus in the cervical region the deep cervical fascia plays a most important part in determining whether—1, the abscess will take an anterior course and open into the posterior wall of the pharynx; 2, whether it will burrow beneath the deep fascia into the thorax as a mediastinal abscess, to terminate by breaking into the trachea, œsophagus, or through an intercostal space; or, 3, whether it will pass laterally between the longus colli and scaleni muscles, and open posterior to the sterno-mastoid upon the side of the neck.

Treves, Jacobson, Hilton, and others, have called especial attention to the great importance that attaches from a surgical point of view to the complex arrangement of the cervical fascia, and Koenig, Henke, Guttmann, and others have pointed out the importance of the fasciæ generally in determining the direction and pointing of abscesses from whatever cause. In the dorsal region the strong fasciæ binding the ribs together determine whether the pus shall find its exit posteriorly upon the skin of the back or sides a short distance from the spine, or whether it shall pass beneath the ligamentum arcuatum internum and enter the psoas sheath to terminate in Scarpa's triangle beneath Poupart's ligament. In the lumbar region it does not appear to me that sufficient attention has been given to the importance of the fasciæ in determining the course of lumbar abscesses from caries of the vertebræ and the effect of this change of course upon the prognosis of these cases.

The usual course for abscesses in the lumbar region is in one of four ways: 1. To be directed to the iliac region along the aorta and external iliac arteries to terminate as a gluteal abscess. 2. To enter the psoas sheath and become a psoas abscess. 3. To burrow through the fasciæ of the quadratus lumborum and the internal oblique muscle to appear on the surface between the external oblique and latissimus dorsi at the outer border of the erector spinæ muscle. 4. To gravitate beneath the internal iliac muscles over the posterior brim of the pelvis, perforating the great sacro-sciatic foramen, to appear as a gluteal abscess.

Why an abscess in the lumbar region should vary so much in its course and termination depends, first, upon the seat of the lesion, and secondly, upon the attachment of the fasciæ.

Variety.	Course.	Exit.
Cervical.	*a.* Anterior.	Into posterior wall of pharynx.
	b. Burrow beneath deep fascia into thorax as mediastinal abscess.	Into trachea, œsophagus, or through an intercostal space.
	c. Laterally between the longus colli and scaleni muscles.	Posterior to the sterno-cleido-mastoid.
Dorsal.	*a.* Burrow posteriorly.	On the back or side a short distance from the spine.
	b. Within psoas sheath.	Beneath Poupart's ligament in Scarpa's triangle.
Lumbar.	*a.* Enter psoas sheath.	As psoas abscess.
	b. Burrow between the fasciæ of the quadratus lumborum and abdominal muscles, through the internal oblique.	Posteriorly beneath the external oblique and latissimus dorsi at the outer border of the erector spinæ muscle.
	c. Gravitate beneath the internal iliac muscles over the posterior brim of the pelvis perforating the great sacro-sciatic foramen.	As gluteal abscess.
	d. May be directed to the iliac region along the aorta and external iliac arteries.	As gluteal abscess.

In caries of the spine it is a well-recognized fact that the tubercular process is usually limited to the bodies of the vertebræ, the articular and spinous processes being never primarily affected and but rarely secondarily involved, their compact structure apparently protecting them. In exceptional instances the lesion is superficial and limited, the intervertebral cartilages escaping, but, as a rule, extension occurs by contiguity of structure until a considerable number or even all of the vertebræ may become involved.

It will be observed in examining a sectional diagram of the lumbar region that the sheath of the psoas muscle and the lumbar fascia are the most important structures in this connection. The sheath of the psoas is a thin fibrous membrane derived from the iliac fascia—attached above to the ligamentum arcuatum internum, laterally by a series of arched processes to the intervertebral substance and prominent margins of the bodies of the vertebræ, becoming below continuous with the iliac fascia. The lumbar fascia divides into three layers, enclosing the quadratus lumborum, multifides spinæ, and erector spinæ muscles, and giving attachment to the internal oblique. Its anterior and middle layers are attached to the transverse pro-

cesses, and its posterior layer to the spinous processes. Above, its anterior layer is attached to the lower border of the last rib, forming the ligamentum externum. The posterior surface of the psoas muscle is separated from the quadratus lumborum by the anterior layer of the lumbar fascia—a very thin fascia—but the greater part of the muscle is firmly supported behind by the erector spinæ muscle. In front, the quadratus lumborum is very thin and offers but little resistance to the exit of the pus.

If the abscess find exit upon the surface of the vertebræ anterior to the attachment of the psoas fascia, it will terminate by burrowing along the great vessels or become an iliac abscess; if it open posterior to the psoas sheath it will burrow backward and laterally along the middle layer of the lumbar fascia separating the quadratus lumborum from the internal oblique, through the internal oblique and between the external oblique and latissimus dorsi, to appear at the outer border of the erector spinæ muscles.

This was the course of the abscesses in the case reported. The sheath of the psoas and the lumbar fascia, as thin as they are, nevertheless are very important factors in determining the direction, and with the direction the prognosis of lumbar abscesses. So great do these fasciæ appear to the writer that he would suggest a division of lumbar abscesses into external and internal abscess, their relation to the sheath of the psoas fascia and the anterior layer of the lumbar fascia determining their position.

THE BENIGN COURSE OF ABSCESS IN POTT'S DISEASE UNDER EFFICIENT MECHANICAL TREATMENT.

By NEWTON M. SHAFFER, M.D.,
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My early medical education was received under the direction of one of the most conservative medical men I have ever met, viz., the late Dr. James Knight, the founder of the New York Society for the Relief of the Ruptured and Crippled. Some of the present members of the American Orthopedic Association also received their first orthopedic training under the same auspices, and with them I can recall the feeling of criticism—not to say ridicule—with which we regarded Dr. Knight's treatment of "cold" abscesses in Pott's disease and in hip-joint disease. Those of our number who passed several years under his preceptorship have had, since we left the institution, ample opportunities to compare his method with the various operative methods; and I think it is a safe thing to say that we are not, even at this date, entirely in accord upon the question of the treatment of chronic tubercular abscess of the spine or major joints.

My own experience has been a varied one. When I left the institution I felt that I had escaped from an unwarrantable restraint, and with the enthusiasm of my years, I went to the opposite extreme, and fell into the error of accepting Sayre's adaptation of the old proverb, "An empty house is better than a bad tenant," a saying, I am assured, that has done much harm as applied to tubercular abscess. Experience has taught me that if a qualification could be added to Sayre's dictum, it would express the real state of the case. And this qualification is: "when one can be sure that the tenant will behave well under eviction, or that the tenant will not damage the whole house before he leaves."

I feel that surgeons generally stand as a unit on the subject of the surgical treatment of *acute* abscess; and if the *chronic* abscess of tubercular disease resembled the acute abscess in its more important particulars, we would not hear the animated discussion that always follows the introduction of the question of the treatment of abscesses arising from tubercular joint disease. And I think it is safe to say that we are all too apt to regard "abscess" in its generic sense rather than in its pathological sense; that we are too apt to regard a fluctuating tumor, containing the products of a chronic, infectious disease, as a something to be gotten rid of at almost any cost, ignoring the fact that the contents of a tubercular abscess differ in many important respects from the contents of an abscess due to an acute, non-tubercular lesion. How many of us would hesitate about the propriety of opening a well-marked, acute, perityphlitic abscess? How many of us would deliberately open a chronic, intra-pelvic abscess due to an active and progressive tubercular disease of the dorso-lumbar spine?

The conservatism of Dr. Knight amounted practically to a surgical nihilism. The extremists who would open every tubercular abscess connected with an actively diseased spine or joint are, I think, as much in error as are those who ignore the indications which point to surgical interference. Unfortuuately, with all our discussions on this subject, we have no statistics to demonstrate either the weakness or the strength of either position; but it is safe to say that more recoveries occur under the plan of non-interference than under the one which indiscriminately applies the knife to every chronic articular abscess.

My own results—after I adopted the plan of opening every chronic abscess—were not so satisfactory as were those which followed non-interference. It is true that at that time the antiseptic method of Lister was not available, and the tubercular bacillus was not discovered by Koch. After the antiseptic method was introduced, I followed it very closely, but still I found my results in chronic abscess of joint disease were not satisfactory. It seemed to me that in opening a tubercular abscess from Pott's disease, for example, we were treating a "symptom" rather than the disease; that we were tapping a reservoir, and paying but little attention to its source; and that we were in too much haste to give exit to the so-called

"pus," which kept on flowing from the source, notwithstanding our external antiseptic dressings. It seemed that high temperature would frequently develop, notwithstanding the gauze, and protective, and irrigation, and drainage; and that repair was delayed rather than promoted by our efforts to find a short route to recovery.

After an experience among many cases and many methods, I came gradually to adopt a course which appeared to me to have a rational foundation. I attempted to insure as perfect a mechanical protection as possible to the diseased joint or spine; to maintain the general health in every available way, hoping that the actual disease might cease before the abscess opened (and this proved to be the case on many occasions), or to await the occurrence of either severe local or important general symptoms, due to the abscess itself, before I resorted to incision, etc. After I adopted this plan, I found to my surprise that many abscesses entirely disappeared—that some became quiescent or encysted; that few, if any, gave rise to trouble; that those which opened spontaneously almost uniformly did well; and that my results were more satisfactory and more permanent.

My experience is that tubercular abscesses in Pott's disease, as well as in the abscesses of the chronic tubercular lesions of the major articulations, pursue a very benign course under efficient mechanical protection to the diseased articulation, and that we too often resort to the use of the knife. If the disease be cured then the abscess becomes a *local* affair, and we may treat it as such, though it then usually disappears spontaneously.

Among the many cases I could submit to illustrate this position, I cite the following:

Master S. W., aged eight years, consulted me on March 4, 1887, bringing a letter of introduction from Dr. Weir Mitchell. The patient had Pott's disease of the spine involving the eleventh and twelfth dorsal vertebræ. There was a slight kyphosis which had evidently been progressing for over a year, but which had been unnoticed until it was discovered by Dr. Mitchell.

The patient was pale and thin, and in a generally bad condition, but gave a good hereditary history. The prominent feature of his case was the presence of three large abscesses—one in the pelvic cavity, another in the gluteal region, and a third on the inner aspect of the thigh—all on the left side. Fluctuation could be detected

between the femoral and pelvic abscesses. The gluteal abscess seemed not to be connected with the others.

Both the gluteal and femoral abscess were very large—the former being especially prominent, while the latter increased the circumference of the thigh three inches over the measurement of the thigh of the unaffected side. The pelvic abscess extended nearly to the free border of the ribs.

The patient had only a slight rise of temperature; the daily evening temperature averaging 99.6°, the morning temperature averaging 98.2°, during a period of over a month, during which the record was kept. The analysis of the urine showed nothing abnormal, and all the vital organs were in good condition.

An antero-posterior support (a modified Taylor's) was carefully adjusted, though at first it seemed difficult, on account of the gluteal abscess, which was so large and extended so high up that it interfered with the hip-band of the apparatus. Special provision being made for this, the apparatus was adjusted, and the patient was closely watched. He went to his home in May, after ten weeks of careful treatment, during which there was a very perceptible decrease in the size of all the abscesses, and in July, 1889, they had wholly disappeared.

Careful attention was paid during treatment to the general health and to the climatic surroundings of the patient. He did not spend one day in bed on account of his spinal disease during the entire treatment. I saw the patient during the present summer (1891), and he is well and strong and as active as most boys of his age. As he is so active, I advised that a very light apparatus be worn as a matter of precaution simply, though I have not regarded the patient as being under treatment since May, 1890. The curvature has not increased.

On November 5, 1890, Miss J. B., of Brooklyn, aged ten years, consulted me, bringing a letter of introduction from Dr. Samuel T. Hubbard.

The patient had Pott's disease of the first and second lumbar vertebræ, with abscesses very much like those existing in the case just related, viz., large intra-pelvic, gluteal, and femoral abscesses; the two last named being especially large and prominent. The patient did not have any rise of temperature above the normal.

The antero-posterior spinal apparatus was applied, and the patient was brought to me from Brooklyn every week. Constitutional remedies were used, and the patient was instructed to go out of doors every pleasant day. At the end of two months there was a perceptible decrease in the size of all the abscesses, and at this date (September, 1891) fluctuation cannot be detected at any point, and the patient is in remarkably good health. The apparatus is still worn and the patient is still under professional observation. The kyphosis has not increased.

I have related these two cases among many others that might be cited, because the abscesses were very large; and whether they had a common origin or not, they were at least multiple in their expression. Simple abscesses in Pott's disease do not occasion me any anxiety, and I have not a single case to record in private practice where, after deciding to pursue the policy of non-interference, I have had occasion to regret it. The cases that have been the most troublesome and the most unfortunate are those in which the abscesses have been opened when the indications for so doing were not plainly evident.

This is only the experience of a single individual. I submit it for what it may be worth, and as a contribution to the study of a very important subject.

GENERAL DISCUSSION ON ABSCESS IN POTT'S DISEASE.

Dr. Hoffa said that he quite agreed with Dr. Townsend as to the treatment. German surgeons had come to the conclusion that it is only wise to open *large* abscesses when they cause much pain, or give rise to high temperature, or when they are pointing, or when it seems certain that the primary bone disease is cured.

Dr. H. A. Wilson, of Philadelphia, believed that some of the unfortunate results of opening these abscesses are due to improper drainage, and that the good results, when achieved by aspiration, were dependent upon the immediate sealing of the wound from con-

tact with the atmosphere. Following out this idea, he has employed two openings by incision to favor drainage, but has carefully closed them by subcutaneous sutures and by collodion dressings, and thought that the results which he had obtained since adopting this method of practice were far superior to those which he had formerly secured. The hyperdistention produced by the gases set free during the irrigation with the peroxide of hydrogen was of service in favoring a thorough application of this agent to every nook and corner of the abscess-cavity. Bichloride of mercury in strong solutions could not be employed safely in the large quantities necessary for the thorough cleansing of such large cavities, while the peroxide of hydrogen gave equally good results without any of the disadvantages of the former.

Mr. Howard Marsh, of England, reported that among English surgeons the feeling was gaining ground that these abscesses should be opened. (1) They are foci for general infection, although he was free to admit that he did not believe that this occurred as frequently as many would have us believe. (2) The proportion of cases in which these abscesses are observed should govern us somewhat in our selection of a suitable method of treatment. It was difficult to estimate the exact proportion, but he would put it at about 15 per cent. (3) In his experience these abscesses generally go on increasing until finally they reach that formidable size to which Dr. Shaffer has alluded. (4) Regarding the danger of opening these abscesses by free incision, it was hardly necessary to say that we must depend entirely upon absolute asepsis, and if this have been secured, English surgeons are of the opinion that there is very little danger attendant upon incising the abscesses if of moderate size. Some of them simply incise freely, and then apply pressure to bring together the walls of the cavity; but Mr. Barker, of the University College, London, takes the greatest possible pains to flush out the abscess-cavity, with the idea of getting rid at once of the whole tuberculous deposit and leaving the cavity quite clean. This can often be accomplished, and then primary union will follow. Lately there had been a considerable number of cases in which by free incision and forcible flushing and scraping the whole tuberculous deposit had been gotten rid of and primary union secured in the course of four or five days.

Personally, he agreed with the majority of English surgeons, that it is best to open freely and evacuate thoroughly, and then to apply pressure to assist in the closure of the cavity, employing strictly antiseptic methods throughout, with rest of the parts. At one time, in the hospital with which he was connected, it was the practice to leave the abscesses alone, and we had many septic cases. Next, we adopted aspiration, and carried out this method persistently for about five years; but in his experience the abscess was rarely cured by the primary aspiration, and in a considerable proportion sepsis at last set in. At present it was their practice to make a free incision and evacuate the abscess as soon as it could be detected. In not more than 4 or 5 per cent. of the cases does this method fail, although, of course, in a few instances sepsis does occur. He was personally of the opinion that these abscesses keep up the disease, and that erosion is constantly going on while these abscesses exist, and hence he was in favor of evacuation if only to stop this process of erosion.

Dr. R. H. Sayre, of New York, had been particularly impressed with the point made by the previous speaker as to the inadvisability of allowing these abscesses to increase until they reached that formidable class of which Dr. Shaffer had spoken. He agreed with Dr. Hoffa as to the conditions under which the abscesses might be let alone. Aspiration was worthy of further trial, because it sometimes succeeds. It should always be supplemented by washing out the cavity, through the aspirator, till the fluid returns clear. Peroxide of hydrogen cannot be satisfactorily employed in connection with the aspirator because the large, frothy masses plug the tube. It should be used with incision and a syringe. When he had simply aspirated, without irrigation, there had been reaccumulation. It is, of course, preferable to leave these cases until the bone disease has been arrested, provided the general health of the patient is not rapidly deteriorating.

Dr. Samuel Ketch referred to a child with two large abscesses in connection with a lumbar Pott's disease, which he had had under observation for four years or more, and in whom the abscess had now nearly disappeared. There had been no evidences of pressure effects, and the general condition had steadily improved. Those

who are in the habit of evacuating all abscesses in the early stages cannot speak with any certainty of the proportion of cases which recover as a result of the operative method of treatment. There did not seem to be any material change in the views of the members of the Association since the discussion on this subject at the last Congress. Regarding the existence of abscesses as a cause of paralysis, he would like to know how their presence is made evident, when there is no elevation of the temperature, no pain, and none of the usual physical signs. It was a question of some interest in connection with the operative treatment for pressure paralysis.

Dr. Benjamin Lee wished to express his adhesion entirely and unreservedly to the conclusions of Dr. Shaffer, viz., never to operate unless compelled to, and if compelled to, to adopt the indications given by Dr. Hoffa. He had gone through the same process of evolution, or, as Mr. Marsh called it, "retrogression," regarding aspiration. He wished to say a word regarding the relation of the physician to the patient and friends. In connection with psoas abscess, in attending a case of Pott's disease, always examine the iliac fossæ, and never allow the patient nor his friends to be the first to tell you that there is an abscess, and when you have yourself first discovered it be particular to make the parents also appreciate its presence, at the same time telling them that it may grow larger and rupture, but that you will make every endeavor to prevent it from doing so. If, then, you succeed in preventing its further development you have obviously gained a great point with the friends; if not successful in this particular, you are still credited with having had prophetic sagacity.

Dr. E. H. Bradford, of Boston, said that in treating of this subject there are two methods of reasoning: (1) by statistics, and (2) by the relation of extreme cases. Unfortunately, regarding statistics, we cannot speak with much positiveness owing to the long course of the cases. While he did not think the danger of opening large abscesses was so great as had been thought by many, he was fully aware that it was not at all uncommon for such abscesses to be absorbed under proper treatment, and he had been fortunate enough to have had such cases. In twenty-five severe abscesses operated

upon by him, no shock followed incision, evacuation, and irrigation. Of course, we are all strongly influenced by our personal impressions, but he had been much impressed in an extreme case of a child of five years brought to him in an extremely bad condition and with double psoas abscess. The prospect of treating such a case mechanically by prolonged recumbency was not feasible, and he accordingly operated at once, incising the abscesses both anteriorly and posteriorly. In three months that child was running around, and in two years it had discarded the brace, not having been kept in bed at any time. He agreed with Mr. Marsh, that thorough aseptic evacuation of these large abscesses saves time, and is often very beneficial.

Dr. Shaffer said that he did not wish to go on record as opposing the opening of these abscesses under all circumstances. He did wish to say, however, that the circumstances under which abscesses should be opened—tubercular abscesses—should be decided by the condition of the abscess rather than by an arbitrary rule.

Dr. George W. Ryan thought that both Dr. Vance and Dr. Townsend must have had exceptionally good results with the aspirator. His experience with it had been similar to that reported by Mr. Marsh and Dr. Lee. When it became necessary to interfere with a large abscess he believed there was only one thing to do, and that was to use the knife, and this he considered the most conservative, as it certainly seemed to yield by far the best results. Where the abscesses are very small and hard he frequently makes use of the hot-water douche—a method of treatment which he had learned from Dr. Gibney. He thought that Dr. Hoffa had stated the conditions exactly where interference was justified.

Dr. T. Halsted Myers said that in the *Surgical Report of the Johns Hopkins Hospital* for 1890, Dr. Halsted proved (1) the impossibility of completely removing the bacilli from the abscess-cavity; (2) that wounds, for some unknown reason, containing bacilli, at times heal primarily. Dr. Myers thought, however, *general infection* more apt to occur in cases where an abscess is opened, from the secondary congestion and laceration of the abscess walls, and from the fact that the incision wound lays open channels of absorption.

Dr. A. J. Steele, of St. Louis, said that dead bone and abscess contents were both foreign, and should be gotten rid of as soon as possible, and hence he advised the free opening of the abscess and thorough washing out. If there was no fault in the technique, the results should be perfect.

Dr. Shaffer, in closing, said that the discussion showed that the experiences of the individual members had been widely different. He intended to have the cases of abscess occurring in the New York Orthopedic Hospital tabulated and made valuable for future study.

Dr. Townsend, in closing, said that American surgeons seemed to agree upon the practice of leaving the abscess alone when it was doing well. His statistics showed over 50 per cent. of the cases cured. This might be exceptional, as he was aware that several cases would sometimes be met with consecutively in which the results from aspiration would be very poor. He had read some time ago in some English journal of a case in which, after incision for an abscess, although the primary wound had completely healed, there was a superficial tuberculosis following the incision of the abscess. This was of interest in connection with Halsted's researches upon the presence of bacilli in such wounds. Theoretically, the opening of these abscesses was safe, but practically it was not. Nicholas Senn, in his *Principles of Surgery*, says that the large majority of these cases become infected at some time or another, and this seems to be the view of most surgeons, and hence aspiration would seem to be a preferable method.

Dr. Vance, in closing, said that the success of aspiration depended largely upon the time at which it was performed. It should be done at the very earliest possible opportunity, and he was even in the habit of aspirating as an aid in diagnosis. He could not understand how large abscesses could exist for any length of time without giving rise to injurious pressure effects. Aspiration was the safest and the most generally applicable method of treatment, and did not prevent the use of more radical means later; it could do no harm, and all admit that it will cure in certain instances.

THE VALUE OF MECHANICAL TREATMENT IN OLD AND NEGLECTED CASES OF POTT'S DISEASE.

By HENRY LING TAYLOR, M.D.,
NEW YORK.

One of the most active and eminent operative surgeons of New York said to the writer, not long ago, that he got but little bone surgery to do, because orthopedic work was so successful. Not the least important service which the pioneers in orthopedy have rendered to the profession and to the public, is the diffusion of the knowledge of the relative curability of most crippling affections; and, as a matter of fact, the adult cripple in our large cities is now much less conspicuous than formerly. There is a class of sufferers, however, still unfortunately numerous, and for whom professional advice is often sought, namely, the class of kyphotics in whom the inflammatory process has dragged out its tedious course through years of suffering and increasing deformity, and who, on account of inadequate treatment or too little persistence, have found no relief. The results of neglected and unsuccessfully treated Pott's disease are so serious, and in many respects so irremediable, that it seems desirable to ascertain under what circumstances and how far their unfortunate condition can be mitigated.

The orthopedist sees cases of spinal caries in all stages, from a time preceding the appearance of spinal deformity to the aggravated hunchback, with or without severe constitutional symptoms; and in whatever stage presented, modern mechanical treatment seeks by appropriate methods to procure rest and protection from violence for the inflamed spine, and to arrest, and in exceptional cases to rectify, accrued deformity.[1] The means employed by the writer to secure

[1] See "The Cure of Pott's Disease with Recession of the Deformity," Medical Record, January 8, 1887.

these results depend upon the principle of antero-posterior leverage so applied to the spine by means of a specially adapted apparatus[1] as to relieve the carious bodies of the vertebræ of harmful pressure. This may be supplemented by short periods of recumbency, daily rests, and other hygienic remedies. It goes without saying that the earlier in the disease the case is treated the better the average result; but what measure of relief does such treatment offer to long-standing and greatly deformed cases?

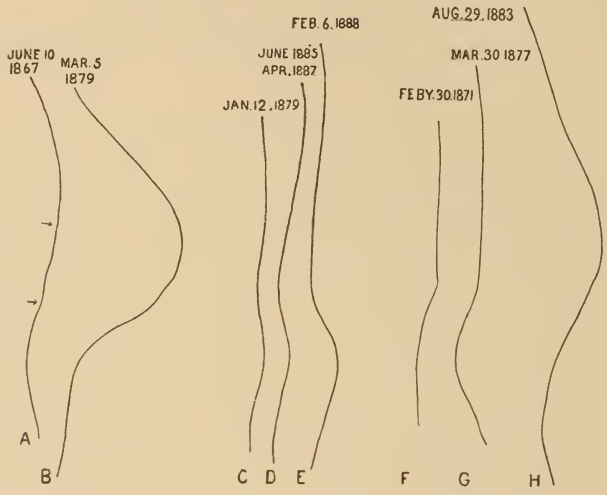
We must distinguish between the treatment of the deformity and the treatment of the disease.

If the case in question has no longer any constitutional symptoms, no symmetrical lateral or ventral pains, no reflex rigidity of the spinal muscles, and no sharp knuckle, but an evenly rounded boss, and if he can move about freely, without distress or exhaustion, the disease has probably spent itself and the vertebræ and peri-vertebral regions have been more or less successfully pieced out with new tissue—which may, however, be inelastic or imperfectly nourished, and liable at some future time to a recurrence of inflammatory softening, after the infliction of unusual violence or through impairment of general nutrition. These cases of spent Pott's disease with large deformity may be energetic and active and hold their own well in business or professional life, but they work on a small margin and at a disadvantage, as the result of crowded viscera, impeded respiration, and a body in which no organ has free play. I remember a middle-aged and cruelly deformed hunchback, who worked as a heavy porter at one of our railway stations, but his face showed the strain he was under, and after a few years he disappeared from his post. Efficient mechanical treatment in the earlier stages provides the sufferer with a substitute backbone, and, by relieving the organism in a great measure from the strain it is under, favors a more perfect bodily development and growth, while deformity is being checked and the healing process inaugurated. Many cases, however, run their course, or a large part of it, without pain, or so little of it and so notable an absence of striking symptoms, that the patient and his

[1] "Description of Improved Spinal Apparatus," Transactions American Orthopedic Association, vol. i. page 15, and Medical Record, November 19, 1887. See also "The Mechanical Treatment of Angular Curvature, or Pott's Disease of the Spine," by C. Fayette Taylor, M,D., Transactions N. Y. State Medical Society, 1863, etc.

guardians are often lulled into false security when help is most needed, and at certain stages the surgeon himself may be at a loss to decide positively as to the presence or absence of disease.

I show the tracings from the back of a boy who came to my father in 1867, at nine years of age, with beginning spondylitis (A); but who declined treatment and reported twelve years later with a severe



hunchback (B) and a freely discharging sinus. He was led by the mildness of his symptoms to indulge in athletic exercise, such as riding and fencing, to within four years of his second visit.

A boy, aged fourteen years, from Chile, South America, with a large kyphosis of the mid-dorsal region, who consulted me a year ago, came wearing a plaster jacket. His disease began at four; at eight he was apparently well, but after violent exercise symptoms recurred followed by a paraplegia lasting six months. This patient was kept recumbent for five years, and had recovered perfectly from his paralysis. In spite of his deformity, and his desire for support as evidenced by the jacket, he had lately been in the habit of playing cricket.

A delicate boy, with disease of the lumbar region, who had done well and whose deformity had been controlled (C, D) for eight years by mechanical treatment, was free from symptoms, but after a six-months' trip to Europe, taken without my approval, his deformity

increased considerably (E) and there were symptoms of vertebral softening; it has taken several years to regain the ground lost; indeed, there was some irreparable damage.

The following case may illustrate the liability of deformity to increase from lack of spinal rigidity, after all disease may reasonably be supposed to be absent.

The patient, a girl, came in 1871, at the age of three years, with a sharp knuckle in the upper lumbar region, as shows in the pattern (F). After nearly six years of mechanical support, during which an abscess appeared and healed, her deformity was rounded and less prominent (G), and she was in good health and free from symptoms. She was considered free from disease, but continuance of support was advised lest there should be further increase of deformity from slow yielding of newly healed tissues. This advice was declined and the apparatus discarded. Six years later, when thirteen, she reported with a large increase of rounded projection (H), but in good health and with no recurrence of symptoms.

Cases which have been allowed to run along without adequate treatment often fail to heal completely and are specially liable to exacerbations and relapses.

A gentleman of fifty, who was attacked with disease in the dorsal region at nine, came to me last year still wearing a corset. At thirty-nine he was completely paraplegic for four months, but recovered, and presented at his visit to me no positive evidence of disease. He had never had an abscess, but his deformity was of the extremest grade, and he appeared to be about four feet three inches tall.

A gentleman of forty was seen in 1883. His disease was in the dorsal region and began at the age of five. He had been kept recumbent for two years, and had afterward had imperfect mechanical treatment. At about twenty he had had three attacks of paraplegia, and since then he had had reflex twitching of the legs, and from time to time attacks of pain. Deformity was very severe, with the apex of the projection in the lower dorsal region. After thirty-five years, disease was undoubtedly still present.

A gentleman about thirty years old, who came to me a few years ago with extreme deformity, had had his disease from childhood, but was free from symptoms for many years until he was injured in a

cyclone three years previously. He was an exceptionally energetic and active man, but had been obliged by the severity of his symptoms to give up everything. Careful mechanical treatment caused the disappearance of all symptoms, and his deformity did not increase during five or six years. After leaving off support, however, he injured himself again, and in a short time symptoms of softening recurred and the deformity increased considerably.

Many of these relapsed cases and those which have been affected for years by a spondylitis of low grade with gradually increasing deformity respond kindly to treatment and may be restored to health and activity.

Some of these cases cited would seem to suggest that complete bony ankylosis after Pott's disease is much later, rarer, and more circumscribed than has usually been assumed to be the case.[1]

If one will take the pains to take a series of lead tracings of the kyphosis in a number of so-called "ankylosed" cases, repeating the observations on the same cases under different conditions from time to time, this statement will not seem too strong. This is also well shown in patterns taken before and after suspension in these badly deformed cases. Changes in the contour are observed which can hardly be wholly explained by compensation in the unaffected portions of the spine. Such cases can often add an inch or two to their height by a voluntary attempt to straighten. In many of the early cases, cured with little or no deformity, motion through the diseased areas can also be demonstrated. This explains the necessity of prolonged treatment after subsidence of symptoms, and the slow yielding of the newly healed spine which often occurs even without recurrence of rational symptoms, when support is inefficient or too soon discontinued; also the liability to relapse from accident or other causes after long periods of immunity. It explains, too, the benefit to be obtained in certain cases from mechanically relieving the patient of the effort of self-support, even where there is little or no sign of disease. The patient's column is out of balance and has to be supported with great effort by the patient's debilitated muscles in their disturbed relations.

In cases of Pott's disease of long standing and great deformity,

[1] Vide "Cure of Pott's Disease, with Recession," etc.

whether in children or adults, the indications for carefully adapted and long-continued mechanical support to the spine are as clear and often as urgent as in recent cases, and such treatment is usually followed by gratifying, and sometimes by brilliant, results. Even when it is too late to improve the deformity, the patient may often be restored to health and usefulness, and in certain cases, after symptoms of disease have subsided, a moderate improvement in the figure and carriage may still be attained. No patient should be denied an opportunity for relief on account of age, severity of the symptoms, or the long duration of his disease.

Mr. Noble Smith, speaking of lateral curvature, is reported to have said recently :[1] "The surgeon should keep the mechanical treatment in his own hands, just as much as he would that of a broken limb." In Pott's disease, at least, he should also continue to control the case until the patient is sound and the spine is self-supporting.

[1] Last meeting of the British Medical Association.

MALIGNANT DISEASE OF THE VERTEBRÆ SIMULATING POTT'S DISEASE.

By A. B. JUDSON, M.D.,
NEW YORK.

I HAVE seen three cases at least, in each of which malignant disease of the vertebræ was supposed for a time, by myself and other observers, to be Pott's disease. The first case occurred in 1884. When first seen the patient, a boy aged four years and eight months, walked with a stiff gait and stooped carefully. Pain in the back and abdomen, the chief symptom, had been present two months or more. There was very slight, if any, projection, but I made a diagnosis of incipient Pott's disease at the first or second lumbar vertebra. When I saw him again, twelve days later, he had been in bed for six days, without motion or sensation of the lower extremities. A brace had been made for him by another observer, but the patient had been too ill to present himself for treatment. He still complained of pain in the back. Pulmonary and urinary troubles intervened, and death occurred ten days later. At the autopsy no caries was found. There were numerous sarcomatous growths springing from the dorsal vertebræ and some of the ribs. They varied in size, the largest having a diameter of two and a half inches. This growth had also invaded the vertebral foramina.

In 1885 I examined the second patient, a man aged thirty-five. It was thought that Pott's disease might be the cause of certain symptoms which had led to a previous diagnosis of renal calculus. The patient was almost entirely disabled. He could with difficulty get upon or rise from the bed. Pain in the lumbar region and in the thighs was the chief symptom. Duration about one year. The normal spinal curves were unbroken. I eliminated Pott's disease, and suggested possible malignant disease. He died five months

later. I am informed that morphine was used until the last, and that malignant growths were found attached to the vertebral column, and in the lungs and diaphragm.

In 1890 I applied a spinal brace in the case of a man aged forty-two, who was paraplegic from supposed Pott's disease of two years' duration. At the eighth dorsal vertebra there was a slight but distinct angle. There was persistent fecal and urinary incontinence. It was thought best to try thorough mechanical treatment before opening the vertebral canal for the relief of the paralysis. No improvement being seen after ten weeks, the canal was explored by an operation which the patient survived but a few days. A sarcoma was found, the presence of which had not been suspected. Inspection was not carried further.

Considering these cases, we are especially interested in the question of diagnosis. The two mistakes here reported would have been avoided if we had waited till kyphosis appeared; but an early diagnosis is always desirable, especially when the lower regions of the spine are in question, where the vertebral bodies are large, and where caries might exist a long time before the natural curves are broken. In none of these cases was there marked projection. In one, the spinal curves were normal. In the others, my notes contain the expressions: "Very slight, if any, projection," and "Eighth dorsal vertebra shows a slight but distinct angle," words which may leniently be reviewed as intended to record suspected points in the vertebral column, rather than important diagnostic indications.

In two of these cases was present the paralysis which has caused this affection to be chiefly known in medical literature as "paraplegia dolorosa." This form of paralysis may well add, as happened in the cases reported, to the difficulty of differential diagnosis. Aside from points of neurological interest, the features of these cases, important to be remembered by us in future examinations, are the local pain and disability and the general reaction. All these patients were very ill, which cannot be said of most patients affected with Pott's disease. They all had severe pain and extreme disability in the back, which Pott's disease is so free from that, when we hear that there is pain in the back and spinal disability, the first thought is to eliminate spinal caries. It is strange, with the back virtually broken, as it is in Pott's disease, that pain and disability are not present and

excessive. It is evident, however, that the recognition of these symptoms in a case of suspected Pott's disease should suggest at least the possible presence of an enemy still more intractable. These two affections are also different in that in one the advance is insidious, while in the other the onset is alarming and quite in keeping with its implacable nature.

In brief, the chief diagnostic points are the following: 1, Deformity, present in Pott's disease, absent in malignant disease; 2, local disability, and 3, local pain, both absent in Pott's disease and present in malignant disease. I submit these thoughts as having some practical application, and would refer for a full account of this, happily not common, affection to the writings[1] of Drs. Edes and Amidon.

DISCUSSION.

Dr. V. P. Gibney, of New York, on March 20, 1885, saw, in consultation with Dr. William H. Draper and the late Dr. H. B. Sands, a gentleman forty years of age, who had been regarded as a splendid specimen of health and vigor, but who had been complaining for nearly a year of obscure pains about his back and lower limbs. His family history was that his father had been compelled, by reason of a pulmonary lesion, to seek a climate suitable for consumptives; that the paternal grandfather died of phthisis, and a cousin of the same disease; his mother and some other female relatives reported to have had lateral curvature.

In April, 1884, while trying to board a moving train, caught on the stanchion and was dragged two hundred yards. Felt the strain at the time and was disabled for a week or more. Fancied that he had recovered at the end of this time and worked at literary work all that summer, twelve and fourteen hours a day. In September had a severe attack of pain in the right side of the chest and loin, which pain completely prostrated him. Had at the time girdle pains about the navel, neuralgic pains in mid-dorsal region, more marked on the

[1] "Cases of Malignant Disease of Vertebræ, with Paraplegia Dolorosa," R. T. Edes, Boston Medical and Surgical Journal, June 17, 1886, pp. 559–562. "Malignant Disease of the Spine: a Contribution to the Study of Cruveilhier's Paraplégie Douloureuse," R. W. Amidon, New York Medical Journal, February 26, 1887, pp. 225–231.

right side; was constipated, suffered from indigestion. December, same year, had a fall on the sidewalk, jarring him considerably; seemed to grow worse after this. Saw a distinguished neurologist in January in consultation with Dr. Sands. Pott's disease was suspected. Other surgeons of prominence were consulted, and, while the diagnosis was not positive, the recumbent posture was ordered.

About a week before I saw him, in March, 1885, he began to lose the use of his limbs. He was much emaciated—that is, comparatively speaking—was unable to sit up or to be moved, from pain and distress in his side; marked spinal tenderness in the upper dorsal region, chiefly over the spinous processes included between the fourth and seventh dorsal. There was in this region a slight prominence, a general antero-posterior curve, extending from the third or fourth to the eighth or ninth dorsal, with a slight depression between the vertebra prominens and the spinous process of the seventh. The lower limbs were paretic, with preservation of sensation in moderate degree; reflexes exalted and tetanoid movements very marked. The bladder and rectum were paretic. Temperature had never been higher than 101.4° F.

My own diagnosis was compression myelitis due to vertebral ostitis or to a pachymeningitis. On the 23d of March Dr. Draper expressed the opinion that he had perineuritis followed by a pachymeningitis, and now a progressive myelitis. Dr. Seguin was added to the consultation on the 23d of March, and he expressed his belief that it was Pott's disease, with the presence of pus and a myelitis. Dr. Draper then expressed the conviction that it was probably malignant.

The case progressed from bad to worse; finally died on the 5th of July. An autopsy was made by Dr. Peabody, who found a sarcoma occupying the body of the fifth or sixth dorsal vertebra. Dr. Peabody's report is as follows:

No deformity of spine observable on external examination.

Brain: Not examined.

Spine: Surrounding fifth, sixth, and seventh dorsal vertebræ, infiltrating soft tissues in neighborhood, and softening bones, is a new-growth of grayish color, not very vascular, soft in consistency. This material is more abundant in and about sixth dorsal vertebra than elsewhere.

Within spinal canal is seen a neoplasm 6.5 cm. long, irregularly cylindrical in shape, with a diameter of about 1 cm. This mass is firmly adherent to wall of spinal canal of sixth dorsal vertebra, its firmest attachment being to left and front of canal. In this situation the cord is compressed to about one-half its normal diameter. No adhesions exist between pia and dura, and no other evidence of local inflammatory change.

Thorax: On removing soft parts from wall of thorax in front, a similar neoplasm is found at junction of right clavicle with sternum. It is about as large as a hickory-nut, and has distinctly invaded manubrium sterni.

Lungs: Loose old adhesions partly general over both lungs. All over surface of both lungs, and thickly scattered throughout their substance, are seen grayish-white masses, very similar in all respects to neoplasmata already described. They vary in size from a pin's head to 1 cm. in diameter, and large masses are surrounded by areas of badly aërated lung tissue.

Heart: Slight hypertrophy of left ventricle.

Kidneys: Surfaces granular; cortices thin; markings indistinct.

Liver: Centres of acini pigmented, peripheries containing fat. A few small new-growths similar to those seen elsewhere scattered through liver tissue.

Neoplasmata in all the different situations examined microscopically proved to be *carcinoma*, in whose alveola were many cylindrical cells.

Diagnosis: Primary carcinoma of lungs with numerous metastatic deposits.

On the 24th of March, 1886, Dr. Draper gave me permission to publish the case.

Mr. Howard Marsh, of London, reported the following case: Mary T., aged seven years, was admitted under his care into the Hospital for Sick Children in 1885. For several weeks her mother had observed that her neck was stiff and painful, so that she was unable to turn her head or to raise herself from the horizontal position without difficulty. Pain extended over the occipital region. On examination, the case appeared to present the usual symptoms of caries of the upper cervical vertebræ. The spine was fixed,

movement gave pain, and the child was unable to raise her head without using her hands for support, and unable to turn in bed. There was marked thickening posteriorly over the spinous processes of the second and third vertebræ. The opinion formed was that the case was one of acute tubercular caries. The symptoms had existed about six weeks. The usual treatment by rest was adopted. Ten days later a swelling formed on the right side of the spinous processes, which, being deep-seated and highly elastic, was thought to be an abscess. A week later the swelling had much increased, and the elasticity was very distinct. An incision was made to evacuate the pus believed to be present, but nothing escaped but blood. The incision was extended to the depth of about two inches, and a director passed in came in contact with bare bone. Still no pus was reached. It was now evident that the disease must be a new-growth. The swelling rapidly increased, and the child died within a month. On post-mortem examination, a large sarcomatous tumor was found connected with the second and third vertebræ. The laminæ of each were in great part destroyed. The growth was evidently primary, and in its structure consisted of round-celled sarcoma.

Dr. R. H. Sayre, of New York, remarked that the diagnosis between tuberculosis and malignant disease was sometimes quite difficult even in the case of other joints. He had seen a case of malignant disease of the knee-joint which had been treated for some time as a tubercular joint.

Dr. DeForest Willard, of Philadelphia, had seen two cases recently, both supposed to be spinal paralysis from caries, which were in reality pressure upon the cord from sarcomatous growths, and the diagnosis in each case was subsequently confirmed by post-mortem examination. The sarcoma appeared secondary to growths in the breasts, and the deposits were diffused through various parts of the body.

PROGNOSIS IN POTT'S DISEASE.

By SAMUEL KETCH, M.D.,
NEW YORK.

In making a prognosis regarding the result of a case of Pott's disease, the surgeon has many different factors to take into consideration. We will succinctly treat of these from the following standpoints:

1. Location.
2. Age of the patient.
3. Etiology.
4. Complications.
5. Thoroughness of treatment.

Clinically the vertebræ, the seat of an osteitis, regarded from the standpoint of prognosis, may be considered as follows:

The superior region, from the first cervical to the third dorsal vertebra inclusive.

The middle, from the fourth dorsal to the tenth and the inferior region from the eleventh dorsal to the fifth lumbar vertebra inclusive.

As a matter of clinical experience, it is commonly asserted that of these regions more cures are effected in the superior and inferior regions, and in a shorter space of time, than in the middle portion of the spine.

In order to have some definite statistics concerning regional prognosis, I have taken 75 cases, under the charge of Dr. Newton M. Shaffer, from the case-books of the New York Orthopedic Dispensary and Hospital, and divided them equally amongst the different regions.

These cases, I would state, were not selected ones, but taken as

they presented in the regular order of admission. I have analyzed them from the following standpoints:

1. Sex.
2. Age at which they presented for treatment.
3. Etiology.
4. Duration from time of beginning of treatment until the patient was discharged cured.
5. Complications arising in the different regions during treatment.

We shall first consider the superior region.

Of the 25 cases, 10 occurred in males, 15 in females—a proportion on which no argument can be based that either sex is peculiarly liable to disease in this region.

As to the age at which the patients presented with disease in this area, I found that the youngest was one and a half year, the oldest seventeen years of age. Five were from one to five years of age; 13 from five to ten years, and 7 over ten years old.

Regarding, as we do, spondylitis as essentially a disease of childhood, although not absolutely so, this would show that during this period—*i. e.*, from one to ten years, 18 cases presented, or about 72 per cent. of the total number. From clinical observation I should be of the opinion that disease in the superior region occurs at an earlier age than in the middle or inferior areas. It is worthy of note also, that with these cases we are not always in the position to discover how long the disease existed before presenting for treatment, questions as to this point eliciting the most vague and oftentimes unreasonable replies. Thus I have seen large kyphoses, which the parents stated that they had only noticed for a short time.

Again, in attempting to arrive at some conclusions regarding the etiology of spondylitis in the superior area, the answer given to the question as to causation, "as stated by patient or parents," was almost invariably, "I do not know." This was also true of the other areas, where no leading questions were asked concerning falls or injuries, the peculiarity in the latter respect being that nearly all the patients could furnish a history of a fall at one period or another. In attempting to the give relation of etiology to prognosis, I shall consider the total number of cases; and of the 75 cases included in this paper no definite cause was assigned in 68.

Seven cases, 3 in the superior region, 2 in the middle, and 2 in

the inferior region, gave unmistakable histories of traumatism. In all of these 7 cases the time occupied in the treatment was much less than in the others, bearing out the fact that simple traumatic cases are, as a rule, more favorable from the standpoint of prognosis.

I found that in 45 of the 68 cases, or about 60 per cent., some evidence of heredity tubercular predisposition could be found either on the side of the father or mother, phthisis being the most frequent disease. This bears out the researches of Jaffé, Gibney, and Taylor, regarding the tubercular origin of the majority of cases of Pott's disease.

The influence of etiology on prognosis is, therefore, most important in estimating the outcome in any given case.

As to the duration of time from the beginning of treatment until the patient was discharged cured: in the superior or cervical area $26\frac{1}{25}$ months was found to be the average time occupied in gaining this result.

The shortest time taken in any given case was three months, the longest eight years. This also included the time of observation after the apparatus was removed, and while the patient was still regarded as liable to relapse. It must also be remembered that these cases were treated in a public institution, that they did not receive the best of home care, and that in many the treatment could not be carried out as regularly and as faithfully as in private practice, all factors which would materially influence the prognosis.

Of the two complications most liable to happen in the course of Pott's disease, namely, abscess and paraplegia, of the total number analyzed, this region gave but 1 case with abscess, and 1 with paraplegia.

In the middle region 15 cases occurred in males, 10 in females.

The time at which the patients presented for treatment showed the youngest recorded age as twelve months, the oldest thirty-two years. Ten were from one to five years of age, 9 were from five to ten, and 6 from ten to thirty-two years.

The average time occupied in obtaining a cure in this area shows an average of $64\frac{18}{25}$ months; the shortest time in any case being one year, the longest eighteen years.

Eight cases in this region were complicated with abscess, and but 2 with paraplegia. The occurrence of but 3 cases of paraplegia in

the superior and middle regions is, I hardly think, a fair estimate of the liability of the superior and middle areas of the spine to the occurrence of this complication, as clinically the proportion is much larger than appears from these cases, and these regions may be truly called the "paraplegic regions of the spine." Two of the cases in the middle area were also complicated by a co-existing hip-joint disease.

In the inferior region 12 cases occurred in males and 13 in females.

The youngest case recorded as presenting for treatment was one year old, the oldest twenty-six years. Thirteen were from one to five years of age, 9 from five to ten, and 3 above ten years.

The average time occupied in obtaining a cure in this region was $47\frac{11}{25}$ months. The shortest time in any individual case was six months, the longest nine years and four months. Ten cases had abscesses and but one paraplegia in this region. Other complications recorded were, morbus coxarius 2, one of these cases being a double hip-joint disease.

It would hardly be commensurate with a paper on the prognosis of such a chronic, painful, and deforming disease as the one under discussion, to dismiss the subject without a brief allusion to the questions of deformity and mortality.

It is an unfortunate fact that the majority of cases brought to the orthopedic surgeon have already advanced to the stage of deformity, and one of the first questions asked is as to the disappearance of the hump.

Regarding its absolute disappearance, I am convinced that very few cases have this fortunate conclusion. We are certainly in the position to prognosticate a smaller amount of deformity in the cervical and lumbar regions, but our art is hardly yet advanced to that point where we can promise a complete recession. That this does occur at times there can be no doubt, and in rare instances we all witness it, but as stated before this Association in a paper read at the last annual meeting, "some of the marvellous cures of supposed organic kyphoses, the result of caries, were in reality puzzling cases of posterior rhachitic curvature."

I am convinced, however, that the prognosis of deformity will be much better in proportion to the time at which we are enabled to

begin treatment, and that in this, as in other deforming diseases, much is still to be done in the way of prophylaxis, by rendering the diagnosis so clear that patients with incipient disease will be placed under treatment at the earliest opportunity.

In regard to mortality, it is my belief that with improved methods of treatment, and better facilities for carrying these out, both in public and private practice, the percentage of deaths from Pott's disease, *per se*, has been materially decreased. Indeed, it is rather with the complications or sequelæ of the disease that mortality occurs. The influence of thorough mechanical treatment on the prevention of abscess and paraplegia will be brought before the Association by another member.

I am convinced, however, that the carrying out of mechanical treatment in every detail exercises a very decided influence in preventing these serious complications of Pott's disease, not only reducing the mortality, but rendering the eventual prognosis more favorable.

As to the statistics regarding mortality, we are already in possession of sufficient bearing on this point. Jaffé, twenty-two deaths in 82 cases ; Mohr, seven deaths in 72 cases, and Billroth and Menzel twenty-three deaths in 61 cases.

A point of some importance in prognosis is the known fact of the tendency of some cases to spontaneous recovery. If this were to apply to any particular class of cases it would pertain to those of traumatic origin in cases without hereditary tubercular taint.

We are, however, in possession of no other means of differentiating these at the beginning from cases which pursue the ordinary chronic course.

Another fact largely influencing ultimate prognosis is the opportunity to be able to carry out treatment over a long period. The statistics here compiled show that in no portion of the spine can we produce uniformly rapid cures, and I should urgently protest against the strong tendency toward the early removal of apparatus, as the relapsed cases only too frequently show the folly of this step.

A *résumé* of the more important points evolved by this analysis would show, in the 75 cases—

That 37 were males.

That 38 were females.

That 28 cases presented from one to five years of age.

That 31 cases presented from five to ten years of age.

That 16 were above ten years of age.

That the average time of treatment in obtaining a cure was—

In the superior region $25\frac{1}{2\,5}$ months.

In the middle region $64\frac{1\,8}{2\,5}$ months.

In the inferior region $47\frac{1\,1}{2\,5}$ months.

That, as a complication, abscess was most frequent in the middle and inferior areas, nearly 50 per cent. developing abscesses in the course of the disease.

That paraplegia may be looked for more frequently in the superior and middle areas, rarely in the inferior.

WIRING THE SPINOUS PROCESSES IN POTT'S DISEASE.

By B. E. HADRA, M.D.,
CHICAGO.

Immobilization of the vertebræ by wiring their spinous processes to each other is a suggestion thrown out in connection with a report of the same procedure in a case of vertebral fracture. The spinous processes of the vertebræ are firmly held together, and when it is considered that there will be no slipping of the wire if the interspinous ligaments and the adjacent muscular structures are preserved, and that three or more vertebræ can be wired, it becomes evident that a resistant posterior brace—so to say—can be established, throwing the body-weight on it, and thereby relieving the vertebral bodies. A second gain is the separation of these latter from each other, or from the inter-vertebral cartilages, which, according to the laws of leverage, obviously must follow. The vertebral bodies will thus be prevented from pressing and rubbing on each other. If this be so, the question arises: Under what circumstances is this method called for? In my opinion, it should be tried as soon as any deviation of a vertebra is discovered. It then will not only do what I have claimed for it, but it will also better prevent permanent disfiguration than any other method, because it is more direct than any other. But if an abscess-cavity has already formed, the surgeon will have to decide whether or not its dimensions are too great to be filled up by new bone-formation. If the abscess-cavity is too large, it may be better to allow the diseased surfaces to come into contact and to unite by bony ankylosis with kyphosis. Under such circumstances the wiring will be out of place. Not so, however, if the destruction of the bodies and of the inter-vertebral discs is moderate. We may then hope for the reproduction of a sufficient

amount of bone, and by holding the spine in a straight line we shall obviously enforce a desirable final outcome.

The proposed operation does not exclude other and later operations, such as draining, scraping, etc. As can easily be imagined, it may even become a very useful addition to them. For instance, it may greatly assist in keeping the drainage track patulous. Perhaps, also, before bony ankylosis has set in, moderate kyphosis could be reduced by careful extension and manipulation, and the gain afterward secured by wiring.

It is hardly necessary to point out the advantages the suggested method would offer over all others at our disposal. It would do away with all the annoyances of the apparatus, of the long confinement to bed, and of a number of other troubles connected with the usual treatment. But, as a matter of course, it has to be proved to be practicable, effective, and above all, free of danger. I know from my one operation (though it was for fracture), and from experiments on the cadaver, that wiring can be done with the greatest ease, so as to be within the reach of the average surgeon. In children the bones may not be strong enough to withstand the grip of the wire, but three or more processes may be included, and thus a greater resistance obtained. As to the direct danger of the surgical procedure as such, I think nothing is to be feared, as may be inferred from the short description to be given.

A median skin-incision is made over the objective spinous processes. I would advise making it rather too long than too short. Now, the long muscles on either side are longitudinally incised with as little laceration as possible, and held aside with retractors—just sufficiently to allow of a good view of the outlines of the spinous processes. Then, with a strong, curved needle carry the silver wire through the inter-spinous spaces above and below the processes to be wired, in a figure-of-8 fashion, as often as is deemed necessary. Then fasten the ends of the wire by twisting, and close the wound. In lumbar operations simple loops around the processes are sufficient, as the latter stand nearly horizontally, and slipping is therefore not to be expected.

Whether in old cases, with much contortion or kyphosis, when no bony ankylosis has taken place, a division of the ligaments will assist rectification or not, I am not prepared to state. I think the possi-

bility that contracted ligaments can stand in the way of reduction cannot be denied.

Finally, it is well to remember that the needle must not enter too far away from the middle line; otherwise injuries to the nerve-trunks may be inflicted.

DISCUSSION.

Dr. R. H. Sayre said that the subject of the paper presented such a novel departure in the treatment of the spine, that one could not properly pronounce judgment upon it at once. He noticed in the model that in the cervical and lumbar regions the vertebræ were separated, while in the dorsal region the separation was not so great. The mechanical power to separate the bodies by wiring the spinous processes is not so great in the dorsal as in the cervical and lumbar regions. The method did not seem to protect the patient from the lateral jarring and twisting of the spine; so that even if wiring came into use, an additional outside protection to prevent this form of traumatism would probably be needed. Nor did he think the wiring possessed sufficient strength to enable it to remove the weight of the body from the diseased vertebræ. He noticed that the spinous processes of the lumbar vertebræ were firmly pressed together, and the question naturally arises, How long could this pressure be kept up before necrosis would develop? In cases of wiring for fractured patella the wire often remains for a long period without injury, while in others it sets up inflammatory changes in the patella, apparently not due to sepsis, but simply to the wire being a foreign body and constantly producing a slight traumatism.

Dr. Royal Whitman thought the author did not take into consideration the difference in the development between the adult spine and that of the child. It is almost impossible to localize the disease as accurately as would appear from the model; braces would be necessary in any case, and he feared that the local irritation from the concealed wire would prevent their accurate adjustment.

Dr. Ketch thought that one of the great objects of treatment in Pott's disease is the prevention of undue traumatism. Knowing that at least the majority of the cases are of tubercular origin, the propriety of performing such an operation may justly be called in question. Are we not inflicting an additional traumatism by this operation of wiring the vertebræ? Nor could he see how the operation could prove to be effectual as a substitute for apparatus.

Dr. Judson said that the chief obstacle in the way of successful mechanical treatment by antero-posterior force is the intolerance of the skin of such pressure as we desire to make on the bones of the kyphos. The method of Dr. Hadra circumvents this difficulty with great ingenuity. It is doubtful, however, whether it is applicable through the long periods in which we are obliged to wait for consolidation.

Dr. Moore, of Minneapolis, speaking from a surgical standpoint, considered it a very simple and harmless operation, and he would be glad to try it, notwithstanding there were certain theoretical objections to it. One of these objections is, that soft silver wire must necessarily be used, and there is danger of breaking off the spinous processes or of snapping the wire. There is a vast difference in the applicability of this operation to cases of fracture and to Pott's disease. In the former it is but a natural outcome of the common practice of wiring in other surgical injuries, but it is very different in such a chronic condition as Pott's disease. It hardly seems possible that the wire will be found strong enough to meet the strains it will be called upon to bear.

Dr. Hadra, in closing the discussion, said that he had not presented this new method without some misgivings as to its efficiency. By wiring together at least three or four spinous processes, he thought the wire could be made to withstand the strain, and it must be remembered that in the living subject there are the inter-spinous ligaments to assist the bone in holding the wire. The question raised by Dr. Sayre about the possible occurrence of necrosis was a point well taken; but if the surgical technique were properly carried out he thought there was little danger of such an occurrence, for the

procedure was not unlike what is frequently seen in other departments of surgery. In order to avoid injurious pressure on the vertebræ, they might be wired, including one more sound one above and below. The criticism made concerning the liability of exciting an extension of the tuberculous process by the operation would be a proper one if there were any direct connection between the operation wound and the site of the tuberculous process.

Dr. Ketch stated that he did not refer to the traumatism of the operation, but to the traumatism of motion, etc. While the spinous processes are not often affected by tubercle primarily, there was usually tubercular infiltration of all the tissues.

OPERATIVE TREATMENT OF SPINAL CARIES.

By DeFOREST WILLARD, M.D.,
PHILADELPHIA.

The operative treatment of tuberculosis of the vertebræ may be classed under three heads:[1]

A. Pus accumulations.
B. Removal of carious bone.
C. Relief of paraplegia.

A. Pus Accumulations.—In former days the accumulations of pus from spinal tuberculosis were permitted to discharge voluntarily, since surgeons found from practical experience that to open these abscesses was to invite hectic fever and death. Without the knowledge of the theory of bacillary infection or of tuberculosis, and in the absence of antisepsis, their practical deductions were correct.

At the present time, however, the surgeon does not hesitate to open these abscesses as freely as he does any other accumulation of pus, confident that with strict care and antiseptic precautions he can exclude all inflammatory or infectious elements. The old pyogenic membrane, which was considered so great an element of evil, is now regarded as a bulwark erected to prevent infection from the tubercular material contained in the cavity, which bulwark must be either eradicated entirely or else left undisturbed.

It is doubtless true that the débris of spinal caries very frequently undergoes caseation or absorption, and that even though liquefaction of caseation occurs, it also is capable of being limited or absorbed by

[1] With Hadra's method of wiring the spinous processes I have had no experience. Theoretically, it would assist in throwing the weight of the superincumbent portion of the body upon the posterior part of the vertebra, as contemplated in the Taylor spinal support. Experience alone can decide upon the advantages of this method. See Trans. Amer. Orthop. Assoc., Vol. IV.

the tissues. In the majority of cases, however, when the superadded inflammatory processes are present true suppuration follows, and this form of pus should be evacuated.

Treatment must necessarily vary according to the seat of the difficulty, the location of the abscess, the accompanying symptoms, and the progress of the case. It is absurd to lay down one law to be rigidly followed. The condition of the patient, hygienically, physically, and socially, will make a decided difference. Some cases, with all favorable surroundings and with thorough mechanical control, may be confidently expected to do well, although no surgical measures are adopted. Others are so situated that more speedy and radical measures must be applied, since, without the assistance of home care, the conditions presented are totally different from those existing even in cases almost pathologically identical.

The surgical aspects of these abscesses vary greatly, and much will depend upon the location of the focus. If the caries is situated in the lumbar region, we can, of course, hope to deal more radically with it than if the disease lies in the dorsal or cervical regions. The position of the point of the disease, whether in the body of the vertebra, or anteriorly, or laterally, or in the articular process, or especially when, as is rarely the case, in the spinous process, would greatly alter the prospect of reaching and removing it. Lumbar caries gives us a direct route of entrance, and a wider possibility for hope that all the tubercular tissue may be removed, while in a dorsal case in which the abscess has reached Poupart's ligament, there is no possibility for practising absolute erasion or excision of the diseased tissues.

Again, when an abscess has opened into the pleural cavity, and has discharged through the lungs, surgical measures are absolutely inefficient for securing thorough removal.

But enough to show that the treatment must be varied; let me deal with the methods.

Aspiration and Injection.—The aspirator has many opponents; some believe that it should never be used, others employ it frequently. It is a valuable diagnostic instrument, sometimes a curative one. The liquefaction of caseation may be drained off through a clean aspirator, and the case, under proper mechanical control, can be cured without an external abscess. A second or third aspiration of a sac which has slowly refilled may be practised with advantage. The plan is simple,

but I do not recommend or practise it alone, save for diagnostic purposes. Having drained off the liquid, it is but a moment's work to inject the abscess-sac with iodoform emulsion, thus securing the aid of this valuable agent.

The walls of a collection of tubercular material should not be manipulated after aspiration, as any fissure in this bulwark which Nature has erected against this dangerous enemy is likely to permit entrance of tubercular material into the circulation, and thus favor dissemination of the disease. The emulsion will find its way into all the recesses of the sac with the natural movements of the body without pressure.

Incision and Injection of Iodoform.—When the presence of pus is rendered certain, either by the aspirator or by fluctuation, or by the physical signs, such as high temperature, etc., the question of evacuation should be thoroughly considered. As a rule, true pus, which is largely due to inflammatory processes, is not absorbed, and while it remains in the body it certainly is a menace. I still adhere to the rule that pus is far better outside of the body than within it, and I shall act in accordance with this view until I am convinced to the contrary by far stronger clinical observations than have yet been presented to me. All of us know that old depots of pus, which have remained dormant for a long time, may, under traumatism or debilitating disease, actively infect the system.

When operative treatment is indicated, and where erasion is impossible, free incision should be employed. The pus escapes under thorough antiseptic precautions, and all the products which can be secured are washed out with a gentle stream of bichloride solution without disturbance of the sac. This hot irrigation should be continued for from five to ten minutes, until it fails to displace any loose fragments. Manipulation is to be omitted, since all fissuring of the walls of the sac should be avoided, for the reasons above stated. The incision is then carefully stitched with closely placed interrupted sutures, and when the last one is ready to be tied, from thirty to sixty grains of iodoform dissolved in boiled olive oil are thrown into the sac and retained there. The wound is then quickly closed, sealed with iodoform collodion, and covered with antiseptic dressings. Absolute rest should be maintained for several days. These injections may be repeated through a trocar every two or three weeks. Some cases show no rise in temperature, others have risen to 103°, though from

what cause I could not discover. I have as yet had no symptoms of iodoform poisoning, but I am always watchful lest this accident should occur. Iodoform seems to possess peculiar powers, and both from my own experience and from the testimony which is rapidly accumulating in the surgical world, its inhibitive power is certainly most marked upon the tubercular bacilli, especially when it can act for a long time, as is the case in closed cavities. We are advancing every day, and should not be discouraged. The investigations started by Koch, though temporarily delayed, will continue until victory is gained.

Incision and Erasion.—If the wound reopens, the treatment will depend largely upon the seat of the abscess. If it is possible to reach and remove all, or the major portion, of the tubercular disease, together with the walls of the abscess, thorough extirpation should be employed. In this operation the incision should be free, and every discoverable portion of the abscess-wall and tubercular tissue should be removed with a knife, scissors, curette, etc. A sharp, hollow, irrigating bone scoop,[1] by means of which a stream of hot sublimate solution can be secured simultaneously with the cutting of the tissues, is advisable. The tubercular material is thus not only washed out, but absorption of the freshly cut surfaces is prevented. Great care must be used that additional risks from infection are not incurred. Unfortunately, in the majority of cases it is impossible to reach the central focus of disease. In these cases we must fall back upon the less effective and feeble measures of—

Incision and Drainage.—Drainage has a wonderful effect in relieving high temperatures by ridding the system of destructive pus-collections. It is of value in the sense that by such relief it removes one of the most serious barriers to the work of cure, viz., rapid exhaustion of the patient's fighting powers under the destructive elements which produce temperatures of 103° or 104°. Moreover, it allows not only the escape of the pus, but it prevents burrowings into the tissues. It also permits washings and injections with anti-tubercular substances. These methods assist in the destruction of the bacilli, but the drug does not remain sufficiently long in direct contact with the enemy to produce any such inhibition as is apparent when iodoform is retained in a closed sac.

[1] University Medical Magazine, April, 1890, vol. ii., No. 7, p. 365.

The use of peroxide of hydrogen (in offensive cases, of full strength, and in milder cases diluted *one-half* with boiling water) has proven a most efficient and valuable measure in closing old sinuses. Of course, if there is dead bone at the bottom of the track, the sinus cannot heal until this has been removed either by the surgeon or by Nature, but in cleansing the indurated walls of an old sinus its action is most beneficial. The preparation to be used should be a reliable one, and should contain the full amount of oxygen. Experience has proven its practical germicidal usefulness.

The long retention of drainage-tubes is a mistake. Their presence tends to provoke suppuration, and after they have made a track for the pus they should be withdrawn slightly at each dressing, when the pus will readily form a sinus for itself. I am satisfied that unless the treatment is thoroughly antiseptic their continued presence permits the admission of suppurative elements.

B. Removal of Carious Bone.—Erasion for the removal of carious vertebræ is an operation which has been practised but seldom, and there is little probability that it will come largely into use, on account of the inherent anatomical difficulties of its performance. At present, the uncertainty in regard to the removal of all the diseased tissues makes the operation one scarcely to be recommended, save in a few selected cases.

In the dorsal region the presence of the long articulating processes makes it impracticable to reach the body of the vertebræ, which is usually the seat of the disease, without extensive resection. As it is absolutely impossible to determine the extent of the bone lesion before making such section, our present state of surgical diagnosis scarcely warrants so serious a procedure. The results to be obtained, if every tubercular mass could be removed, would certainly warrant the plan, but for the reasons already given this is impossible.

In the lumbar region, however, the plan is feasible, provided the spinous processes or arches are the seat of the disease. The great strength and robustness of the articulating and transverse processes, the large size of the bodies and the depth to which they are situated, and the large mass to be cleared away, makes the operation an exceedingly tedious and troubleseme one. A partial erasion with knife, scissors, sharp spoon or scoop, or gouge, is often performed, but there is no certainty of its completeness unless a large opening is made.

The incision in the lumbar region should be along the edge of the erector spinæ group. The muscular fibres can then be drawn aside, the quadratus divided, and the transverse processes followed down to the body of the vertebra. Any existing sinus is the best lead to follow. It is not an easy task to reach and explore these deep structures. The bodies of the vertebræ are so protected by immense muscles, multiple tendons, and strong fasciæ, that all of us who have operated in this region know the difficulties to be encountered in clearing the tissues from the bones, and the necessary delays which render resultant death from shock not impossible.

The thorough drainage which is constituted in these cases permits direct exit of the débris, and, in my opinion, is the chief benefit to be derived from the operation, although all dead bone which is excised shortens the process of Nature's slow removal. These cases of lumbar caries, it should be remembered, however, are the ones which yield the best results, even without surgical interference, and unless the disease is situated in the posterior half of the vertebræ the operation is not warranted. The process of removal will undoubtedly destroy the superficial underlying layer of bone-cells, and may prove the beginning of a fresh ostitis, if not of tubercular infection.

The immediate risks of the operation are considerable.[1]

C. Relief of Resultant Paraplegia.—In two articles read before the College of Physicians[2] I have discussed the question of the removal of the laminæ, not only for injuries of the bones themselves, but also for the relief of pressure paralysis. As the tubercular process progresses in the vertebræ and encroaches upon the spinal canal, external pachymeningitis may result. This pressure, as a rule, is not dependent upon the angularity of the cord, as in some cases where almost a right angle is attained no pressure symptoms are developed.

The encroachment upon the calibre of the canal may be from bony deposit, tubercular infiltration, the presence of caseous material, or inflammatory infiltration.

Frequently the condition of paraplegia is remediable by perfect rest and extension, either by absorption of the material or by accommodation of the cord to its new position. Certainly this result is obtained in a majority of cases even where loss of power has been total, and

[1] Trans. College of Physicians, Philadelphia, March 6, 1891.

[2] Ibid., March, 1889; February, 1891.

although electrical reaction has been absent, and the reflexes increased or lost, yet entire recovery has taken place.

The results from rest and extension (both upward and downward) have been so decided and beneficial that I have never seen a case which in the end justified the removal of the laminæ. Many which seemed hopeless have, under treatment, made rapid improvement, and at last have walked with comparative ease.

In looking backward to the cases of ten, fifteen, or twenty years ago, which were paralyzed for a longer or shorter period of time, I cannot recall one which is not now walking about, although many have, of course, passed from observation. These older cases were treated by rest alone, but showed marked improvement in periods varying from one to eight months, or even longer.

The operation of laminectomy, as I have done it for wounds and fractures of the vertebræ, is not an easy one. It is difficult to clear the muscles from the spinous processes and laminæ, and the removal of the first lamina, whether by saw, cutting forceps, or otherwise, is a slow procedure.

The best method is to cut away the spinous processes, either absolutely or in the manner proposed by Abbe, viz., to cut through their bases and to permit them to slide slightly aside. Many surgeons employ cutting bone-forceps, but I prefer a saw with a short cutting face, like Hey's, or one such as used by Macewen, with an adjustable angle handle, for the first lamina, since it can be best worked in the deep cavity. All of us who have operated low down in the dorsal or lumbar region find the same annoyance. The divided muscles bleed freely, and the point at which the laminæ lie is so deep that safety cannot be sacrificed to haste. When the lamina is removed the ligamentum sub-flava may at first be mistaken for the cord itself, although when the cord is actually reached the difference in appearance is plainly perceptible. When one lamina has been removed the cutting away of the remaining ones is comparatively easy, if narrow rongeur forceps are used with the lower blade flat. The gnawing process easily cuts away whatever bone is desired without risk to the cord. I have had constructed a pair of narrow-based blades, so that they will not become impacted in the bone.

Cases recorded by Macewen, Thorburn, Ferrier, Horsley, Lane,

and others,[1] while showing a large percentage of improvements, yet do not warrant us in concluding that any great good has been secured by operative treatment. Theoretically, the relief of pressure ought to greatly benefit these cases, as the expansion of the cord by the relief of posterior pressure should permit accommodation of the soft structures to the anterior encroachments, but the results thus far obtained do not prove this to be the case.

If the tubercular focus is situated posteriorly in the arch, then the operation is decidedly favorable, and should be undertaken without hesitation. This can usually be determined by exploratory incision.

Mechanical treatment should never be omitted during continued surgical procedures; the latter are simply adjuvants; and that all-important element of success, *rest of the diseased tissues until Nature can cure by ankylosis*, should be continued either by decubitus, by extension, or by apparatus. The curative effect of good air, good food, and the best hygienic surroundings, should never be omitted. Fresh air can be perfectly easily obtained, even when the recumbent posture is imperative. Tonics, alteratives, etc., should be judiciously administered.

Conclusions.

1. Recumbency, extension, mechanical support, suspension and support of the diseased vertebræ until thorough ankylosis has resulted, are exceedingly important preventives of and additions to operative procedures.

2. Dormant and caseating foci may well be treated on the expectant plan.

A.—1. Liquefying and caseating collections should be tested with aspirator and injected with iodoform emulsion, the operation being repeated until the tuberculous process is arrested, or until pus is discovered.

2. If sero-purulent fluid is drawn, injections may still be relied upon to assist the system in conquering and limiting the tuberculous process.

3. When true pus is present, the abscess should be incised, and the cavity washed out by a long-continued flow of hot sublimate solution,

[1] Thorburn's Surgery of the Spinal Cord, p. 144; Am. Journ. Med. Sci., 1891, cii. 25 (103 cases).

but manipulation should not be practised upon the walls of the sac lest a fissure be occasioned and entrance of tubercular poison into the system be facilitated. The incision should be carefully sutured, and from thirty to sixty grains of iodoform dissolved in boiled olive oil injected and retained in the cavity.

4. When the situation of the abscess is in the lumbar region, and the case permits of the thorough removal of the sac, incision of the abscess, and excision of its walls with knife, scoop, and scissors, together with the removal of all tuberculous material, should be practised.

5. When excision of the wall is impossible, free incision and drainage, coupled with iodoform injections, are palliative, and will assist in shortening the removal of the diseased tissues.

6. Drainage-tubes should not be retained longer than is necessary to form a track for pus.

B.—Excision of diseased bone tissue is feasible when it is situated in the arches, and occasionally in the lumbar region when the articular and transverse processes or the side of the body are affected. It is an operation very limited in its scope, and should be practised only in the cases mentioned. For the purposes of drainage, however, it is beneficial.

C.—1. In the majority of cases of pressure paralysis, recovery takes place after extension and mechanical treatment.

2. Removal of the laminæ for the relief of pressure paralysis is only to be employed after the thorough trial and failure of long-continued horizontal extension, counter-extension, and fixation, unless dissolution is rapidly threatened.

3. Operation for the removal of the laminæ is a troublesome one, except in the upper dorsal region, and entails considerable risk to the patient.

4. In caries of the arches, and when pressure is posterior to the cord, the operation is advisable, since opportunity is offered not only to relieve the pressure, but also in certain cases to simultaneously remove the diseased focus.

5. When the pressure is anterior, either from bony deposit or caseous material, or from tubercular infiltation or inflammatory deposit, no permanent benefit will be secured even though temporary gain is apparent. The pressure is usually the result of an external pachy-

meningitis, yet does not necessarily indicate hopeless degeneration. The temporary benefit arises from the relief of pressure and the clearing of the canal from tubercular masses. If thorough eradication of the material could be accomplished, the results would be more hopeful.

DISCUSSION.

Dr. Hadra said that Dr. Ketch had shown by statistics that it takes from twenty-six to sixty-four months of treatment to cure a case of Pott's disease. Studying the subject from a pathological standpoint, we learn that the body protects itself by the formation of a sort of pyogenic membrane, with the result of preventing the absorption of the enclosed débris. Experience teaches us that as soon as this barrier is removed absorption begins. Now, the contents of the abscess stimulate the formation of the protecting shell, and we have to remove the former to put the latter in a more favorable condition. Therefore we have to evacuate the abscess. He thought iodoform acted by improving the absorptive power of the pyogenic membrane, besides its anti-bacillar virtues. When kyphosis occurs, it is evident that a cavity of greater or less size has been formed. The general principle that such abscesses should be evacuated is in accordance with our general ideas of pathology.

Dr. Ketch thought there would be no question of the propriety of interfering with abscesses, if we were sure that by such treatment we could absolutely cure the disease. It would appear that in our anxiety to treat a single symptom, we had neglected the disease itself. All of us would be glad to hear of any method which would materially shorten the treatment of the disease. He referred yesterday to a case of paralysis continuing long after active symptoms of bone disease had subsided, and Dr. Willard has spoken of the treatment of paraplegia resulting from pressure of an abscess. He desired particularly to ascertain how long a time should be allowed to elapse before resorting to the rather grave operation of laminectomy.

Dr. L. A. Weigel, of Rochester, said that if he remembered rightly, Dr. Senn had made a point that iodoform used in a cavity

acts as a foreign body and is not absorbed. Within the last month he had seen a case where necrosed bone had been removed and iodoform dusted into the cavity. The operation not proving entirely satisfactory, a second one was performed about two months later, and on scraping away the new granulation tissue, one could see the grains of iodoform there in exactly the same condition they were in at the time of the first operation. He would like to know whether the same would be true of iodoform emulsions.

Dr. Moore, of Minneapolis, said that in cases of abscess of the hip it is reasonable to expect that they can be reached and thoroughly cleansed with iodoform emulsion and closed up, and allowed to heal by primary union. The evacuation of spinal abscesses is a matter of much greater surgical responsibility, as it is an aseptic cavity, and there is great danger of infecting an abscess which is so large and so difficult to cleanse. It might be possible to keep such abscesses aseptic for three months, but the chances of keeping it so for three years, as might be necessary, was an entirely different matter. He had not made much use of the injections of iodoform emulsion, but he was much encouraged to hear Dr. Senn say that he had repeatedly emptied cavities containing several quarts, and after several injections of the emulsion at intervals of a few weeks, the absesses had entirely disappeared. The speaker said if he felt that he could get such results he would at once adopt this treatment for spinal abscesses.

Mr. Howard Marsh, of London, said that so far as noticed, paralysis is much more common in the dorsal than in the lumbar and cervical regions. He thought the paralysis was very rarely dependent upon the pressure of an abscess; it was much more likely to depend (1) upon softening of the cord, which was rare; (2) pressure of a displaced sequestrum, and (3), most common, pressure from inflammatory exudation. It is very difficult in any particular case to determine the cause of the paralysis, and hence laminectomy necessarily becomes an exploratory operation in most cases. He had in mind the case of a boy who had had prolonged Pott's disease, and three separate attacks of paralysis dependent upon the circumstances in which he was placed. We should only operate on these cases after thoroughly and completely testing whether or not by rest the paralysis will disappear. He had

left a boy in the hospital with absolute paralysis up to the arms, who was unable to move his limbs, and there was incontinence of urine and feces. He had been disposed to perform laminectomy, but, instead, the patient was placed in bed, and improvement soon began and is progressing rapidly.

Dr. Willard, in closing the discussion, said that he agreed with the opinions just expressed by Mr. Marsh concerning the most common causes of paralysis. We could not absolutely diagnosticate the cause of a pressure paralysis. When there are extensive inflammatory deposits about the arches, we are justified in believing that laminectomy will relieve the posterior pressure and allow of the expansion of the cord. We may also in some cases be able to remove bony growths. These two conditions are the only ones, he believed, which could be permanently relieved by laminectomy.

The long-continued action of iodoform in a closed sac is the reason apparently for it acting so favorably in destroying the bacilli there contained.

THE TREATMENT OF POTT'S DISEASE, WITH ESPECIAL REFERENCE TO THE EARLY STAGE.

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When Pott's disease is subjected to treatment in its early stage, *i. e.*, before the occurrence of angular deformity, its behavior suggests that it may be influenced by therapeutic agents with greater advantage than at any subsequent period of its development. In a very large percentage of such cases perfect arrest of the disease may be effected and angular deformity prevented; furthermore, this result may be secured in a space of time much shorter than is required to accomplish its arrest when treatment has been delayed until angular deformity has made its appearance.

The whole aspect of the disease, as regards its prognosis, undergoes an important change when treatment can be instituted before the appearance of angular deformity. The serious character with which the disease is generally regarded, its dangerous complications and formidable sequelæ, all become greatly modified under these circumstances. Abscess and paraplegia then become rare events, and the occurrence of secondary infection, *e. g.*, tubercular meningitis, etc., is greatly diminished in frequency. The pathological conditions which characterize the early stage of Pott's disease are favorable to this view, *i. e.*, the focus of infection at this period is of small extent; the vertebral body has suffered no material change in its shape; the weight-bearing function of the vertebra has not, as yet, been seriously deranged. As a consequence, reflex muscular contraction, and all other forms of neural disturbance which are the effects of the morbid process, are greatly modified. Viewing the completeness of recovery which commonly follows efficient treatment in the early stage of Pott's disease, one is stronly inclined to

regard the tuberculous process, at this period, somewhat as a benign matter. That is to say, more importance may be attached to the functional use of the affected vertebræ, and the mechanical force which is thereby exerted upon the inflamed bone, for promoting the extension of the disease, than to its inherent tendency to invade new tissues.

If, following localization of the disease, the functional use of the part were for a time abolished, the contiguous healthy tissues would seem to offer sufficient resistance to the infecting agent to not only prevent its extension, but also to render the encapsulated focus incapable of doing further harm as a centre from which secondary infection could emanate. Taking into account the efficiency of mechanical treatment for arresting the disease in its later stages, when the pathological conditions offer the maximum of resistance to therapeutic measures, it is proper to assume that the same degree of effort, applied to its treatment in the early stage, would be relatively more effectual for promoting the arrest of the morbid process and restoring the parts to a state of functional integrity.

With so many advantages of practical value to be secured by the timely recognition of the disease, and the early resort to restraining treatment, the wonder is that it should be the *exception* that treatment is begun in its early stage.

In explanation of this fact, the reasons commonly given point to the difficulties of early diagnosis—*e. g.*, the insidious invasion and encroachments of the disease; the obscure character of the symptoms in the early stage, etc. These should not be regarded as sufficient to excuse the physician for overlooking the disease at this time, especially when the parent, who is devoid of specific knowledge of the subject, will form an opinion based on the abnormal behavior of the child, which is substantially correct in its diagnostic bearings. This statement is no exaggeration, judging from the frequency with which this matter is referred to when obtaining the histories of such patients. The truth is, that the peculiar train of symptoms in this class of cases have a close resemblace to many minor functional disorders. Some physicians appear unwilling to believe that a condition so common and formidable as Pott's disease can have a beginning apparently so insignificant; or they are too ready to explain it away as a matter of transient character—rele-

gating it to the class of undetermined ailments, as, *e. g.*, spinal irritation, nervous prostration, rheumatism, neuralgia, etc.

This deception of self, as well as of the patient, often goes on until the occurrence of angular deformity suddenly throws new light on the matter. This frequent oversight by physicians is to be attributed, in larger degree than to any other cause, to the importance that is attached to the presence of angular deformity as a clinical event of diagnostic value. When angular deformity exists in even slight degree, it should serve only to indicate that the pathological process in the vertebra has reached its ultimate form. That the earlier clinical phenomena of the disease should be lost sight of, in contemplation of this more prominent event, is to be expected, however, in view of the fact that the teachings of three-fourths of the text-books on surgery make angular deformity the chief diagnostic sign of the disease.

Another matter of some importance touching upon this subject would seem to be, that the symptomatology of the early stage of Pott's disease has been overdrawn, so that it represents a degree of irritation that would be expressed only in the advanced stage.

Reviewing the symptoms, as the writer has had occasion to observe them, in cases in which the diagnosis was made prior to the occurrence of angular deformity, their appearance is greatly modified in severity as compared with what is present when only a slight degree of angular deformity exists.

While a detailed account of the early symptomatology cannot be considered in this connection, it may be briefly stated, however, that the clinical history in a number of cases of advanced Pott's disease will show that the neural disturbances exhibited in the early stage are chiefly those which, by progressive development, have acquired prominence as characteristics of the stage of angular deformity. The osteitic cry, or night-pains; neuralgia of one or several of the spinal nerves which are in close relation to the affected vertebra; abdominal or thoracic pain; functional derangement of the respiratory, circulatory, or digestive organs from irritation of the sympathetic; paroxysms of painful spasm of the muscles of the trunk; rigidity of the muscles of the trunk and loss of spinal mobility, due to voluntary and reflex muscular contraction; impairment of the powers of locomotion, etc., all will be found to exist in

much more moderate degree in the early stage than is usually ascribed to that period of the disease. In another place (*Annals of Surgery*, July, 1889) I have directed attention to the presence of spinal distortion in the early stage of Pott's disease. This sign is universally present when the dorsal or lumbar vertebræ are involved, and it may be relied on to confirm the evidence which the other symptoms furnish.

Reflex muscular contraction is not a symptom of enough prominence in the early stage to readily attract attention, but such as may be present is concerned chiefly in maintaining the trunk in one or another of the distortive positions which are so commonly assumed by the patient. The spine in this position may be more easily immobilized by the muscles, and, at the same time, the weight which the inflamed vertebra should sustain is so disposed as not to fall directly upon the bone, but chiefly upon one side of the vertebral body and the corresponding articular process.

This attitude is suggested undoubtedly by the tenderness which the inflamed bone evinces to weight pressure and the ability to diminish this, in part, by immobilizing the spine in one of these malpositions. By adjusting the weight upon the inflamed vertebra in this manner, from an early period of the disease, there occurs a greater or less amount of distortion of the trunk, and this acquires prominence in keeping with the irritation symptoms; in some cases it quickly attracts attention, while in others its presence is revealed only by careful inspection. The reflex contraction, by which this malposition is maintained, does not yield to extension force with greater readiness than occurs in analogous muscular contractions elsewhere in the body. During the employment of suspension extension, *e. g.*, when applying the plaster-of-Paris jacket, the distortion is not modified in any essential degree. This may be seen following the removal of the jacket, by its examination separately from the patient, or, if a solid cast of the patient's figure be made by filling the jacket with plaster-of-Paris, the cast will show the distortion with especial clearness. This matter has been referred to somewhat in detail, not only because of its diagnostic value, but also for the reason that the correction of this distortion is of importance in connection with the mode of treatment that should be employed in the early stage of the disease.

As regards the plan of treatment required for the early stage of Pott's disease in the different regions of the column, it may be sufficient to state that the method to be employed in cervical or high dorsal localization should differ in no essential manner from that which is required in the advanced stage of the disease. In these regions the enforcement of spinal fixation is attended by obstacles that are more difficult to surmount than in the lower part of the column, and often this will necessitate a departure from or variation of any method which may have been originally selected. Thoroughness in attention to the details of treatment, and perfect adaptation of the means to the end, viz., the maintenance of vertebral rest, are here demanded to accomplish the arrest of the disease in any of its stages. Naturally by the employment of such measures in the early stage we should succeed, not only in preventing the development of angular deformity, but the time of treatment should be materially shortened as compared with what is necessary in the advanced stage. In addition to these the patient would be relieved of much of the tediousness and confinement which are inseparable from the treatment of this especial variety of Pott's disease.

With the site of the disease below the fifth dorsal vertebra, its management becomes greatly facilitated; but, with this diminution of difficulty attending the treatment, in this locality, there is a large increase in the frequency of its occurrence as compared with the higher regions of the spine.

Regarding this more common class of cases of Pott's disease, *i. e.*, where the lesion is located below the fifth dorsal vertebra: Is there any method of treatment which should be preferred in view of its especial adaptation to the requirements of the early stage? In the late stage of the disease the requisites of successful treatment may be summed up in one word, viz., fixation. Then we have to take cognizance of angular deformity, chiefly with the view of preventing its increase, not of effecting its removal; the indications of treatment are fulfilled, however, by the employment of measures directed to both of these ends; following the arrest of the disease, the presence of more or less angular deformity must be regarded as inevitable. In the early stage of Pott's disease, however, the views regarding its treatment are widely different. By appropriate treatment the disease may be prevented from advancing to the stage of

angular deformity. To accomplish this end, fixation of the vertebræ is required, which should be as effective in quality as that employed in the late stage. Aside from this, the question of deformity is limited to the removal of the distortion. These two features in the plan of treatment should be carried out conjointly. The distortion may be said to be the deformity of the early stage; in this connection it is susceptible of correction by force properly directed to the contracted muscles. This is a matter which may be regarded as subordinate in importance, compared with effecting the arrest of the disease. For various reasons, however, it is of consequence that the spinal curves should be made to resume their normal relations: 1st. The distortion is often present in a conspicuous degree, and would remain as a permanent alteration of the trunk were attention given solely to the efforts to maintain fixation of the vertebra. 2d. When the spine is properly restrained it is better that the weight should be distributed over the whole area of the affected vertebra rather than to rest upon a portion of it; especially is this true when the spine is so supported that the articular surfaces of the affected vertebra would bear a large proportion of the weight resting upon them. 3d. The removal of distortion enables the column to have better functionating qualities following the subsidence of the vertebral lesion. The early stage is the only period in the development of the disease in which recovery may take place in a manner that may be called ideal, *i. e.*, without deformity and with complete restoration of functional power in the spine. In the final result, deformity of this type is wholly unnecessary; the effort should therefore be made to get rid of the distortion at the same time that the spine is being immobilized for the relief of the inflammatory symptoms. This is the more to be insisted on in view of the ease with which it may be done.

As regards the especial form of apparatus to be employed in this connection, the writer will confine his remarks chiefly to the appliance familiarly known as the spinal jacket. Treatment by this plan furnishes at once the means for effecting spinal fixation in a manner that is easier of application and more effectual in its action, and at the same time possessing fewer objectionable qualities, than any method in vogue. To carry out the idea of treatment that I have outlined with reference to the early stage by means of the spinal jacket, the rule which is usually followed when making the plaster-

of-Paris jacket must be changed in an important manner, viz., the permanent jacket should not be moulded upon the patient's body, but upon a plaster-of-Paris cast from which the distortion had been removed by modelling. It was previously stated that the distortion in the early stage is only slightly influenced by suspension. It is evident, therefore, that a fixative spinal support like the plaster-of-Paris jacket, which conforms intimately to the shape of the body, will serve to maintain the distortion in an unchangeable position. The reapplication of the plaster-of-Paris jacket at intervals does not materially modify the distortion. The same may be said of a jacket made of any other material which has received its shape by being moulded directly upon the patient's body. Whatever may be the explanation of the fact, one thing is certain, viz., that the quality of such support does not effect sufficient relaxation of the muscular contraction to permit of further correction of the distortion by repeated applications of the jacket. In the experience of the writer, the use of the plaster-of-Paris jacket in the early stage of Pott's disease has not produced ideal results such as have been obtained by other means. This statement refers to the persistence of the distortion following the arrest of the disease, and also to the greater length of time required for treatment. Other disadvantages pertaining to the use of the plaster-of-Paris jacket need not be mentioned, except to refer to the frequent reapplication which this method of treatment necessitates. For this reason patients can with difficulty be persuaded to submit to this course of treatment for the space of time that it is necessary to employ restraint; they become discouraged by the repetition of the process, and, as a rule, become indifferent and discontinue the use of the jacket long before it is safe to discard support. Usually, it is not until the disease again shows signs of activity that the effort to restrain its progress is renewed, and, in this connection, it is generally the exception when there is a return to this especial mode of treatment.

For these reasons the writer has discarded the use of the plaster-of-Paris jacket, as it is ordinarily applied, in the treatment of Pott's disease in its early stage. In its place a jacket is used which is made of perforated belting leather, that has been formed upon a corrected plaster-of-Paris cast of the patient's body. To make the cast, a temporary plaster-of-Paris jacket is first applied to the patient;

this is removed as soon as it has set, and filled with plaster-of-Paris of the proper consistency for making a hard, solid cast. The jacket is then stripped off and the cast subjected to a process of modelling, with the view of giving it the shape which the trunk would have were the spinal column in the normal position. Briefly, the distortion in the cast is removed by cutting away the prominences and building out with plaster-of-Paris the corresponding depressions, which occur as the result of the twisting movement which the column has undergone. When these changes have been rectified throughout the circumference of the cast, the torso will correspond with the normal form of the patient. A piece of leather of the proper size and firmness is then soaked in warm water and wrapped around the cast, and forced down upon it by winding tightly around it a strong rope, the successive strands of which are placed close to one another and hammered firmly until the leather touches the cast. For convenience of winding the rope upon the leather when forming the jacket, the cast may be placed in a frame, a strong stick having been passed through the cast at the time it was made, by means of which it can be turned in the frame in the manner of a windlass. The rope having been removed, the leather while wet is perforated upon the cast with a No. 12 punch. The cast with the jacket fastened upon it may then be placed in the sun or over a heater to dry.

This process has been previously published by the writer (*Annals of Surgery*, July, 1889), so that it is unnecessary to repeat it in greater detail in this connection.

The leather jacket is not at first a perfect fit for the distorted body. It is fastened upon the patient by means of straps, while he is in the recumbent position. Following its adjustment in this manner, the patient is directed to maintain the recumbent position for two or three days. It will then be possible to tighten the jacket a little further without causing discomfort. When the patient resumes the upright position it will be seen that the distorted body has adapted itself quite perfectly to the jacket. Many times I have seen the distortion disappear in a week or ten days following the first application of the jacket; in other cases the restoration to the normal position would occur slowly—depending on the degree of intensity of the irritation phenomena or the period of duration of the disease.

A gradual relaxation of the reflex muscular contraction is indi-

cated by this alteration in the shape of the trunk under the combined influence of recumbency and the restraint exerted by the jacket. By placing the distorted trunk in a *straight* jacket in this manner we are able to make the body fit the jacket, so that, almost from the first, it is maintained in a state of fixation in a normal position. This correction of malposition is not permanent during the first two or three months following the application of the jacket; that is to say, when the jacket is removed for purposes of examination, etc., the distortion gradually returns if the patient is allowed to stand for a short time with the spine unsupported. This tendency of the distortion to recur on removal of the jacket gradually diminishes as the patient continues to wear it for a longer period of time, until finally the erect position can be maintained with only a natural effort. Long before this time, however, the symptoms of irritation will have diminished or disappeared, showing that the jacket is an efficient appliance for maintaining vertebral rest. Furthermore, the fixation afforded in this manner is of a uniform quality, attention being given daily to the degree of tightness with which the jacket is worn. Patients themselves show a disposition to wear the jacket strapped as tightly as possible—experiencing thereby more relief from irritation, and, as a rule, making more satisfactory improvement.

Following a period of restraint of this character, ranging from eighteen months to two years, patients are, as a rule, able to lay aside the jacket without manifesting any of the signs of the disease. When convalescence is established, the support which the jacket affords is carefully taken away from the spine, permitting the resumption of functional work in a gradual manner.

A jacket made upon a "corrected" cast may be constructed of other material than leather; *e. g.*, a permanent plaster-of-Paris jacket may be formed upon it, as suggested by Dr. Lovett.[1] Wood, bandage, paper, etc., may also be used for this purpose. It is the principle in the construction of the jacket that is of chief importance, not the material of which it is made; provided, of course, that it possesses the strength to withstand the weight it should sustain. The use of leather for this purpose by the writer is a matter of individual choice, suggested by its workable properties and its durability and cleanliness while in use.

[1] Trans. Amer. Orthop. Assoc., Vol. III., p. 159.

This plan of treatment has been in operation by the writer for a period of time extending over about ten years. During that time he has had occasion to treat sixty-five patients with Pott's disease in whom the stage of angular deformity had not been reached when they were placed under his care. In all of these cases the disease was located between the fifth dorsal and third lumbar vertebræ. Of this number, in only three instances has the disease progressed and caused angular deformity. But even in these cases this event was not necessary, and was due largely to meddlesome interference with the plan of treatment.

In two cases death occurred from secondary tubercular infection while the patients were under treatment for the spinal lesion; pulmonary tuberculosis and cerebral meningitis, respectively, being the cause of death Psoas abscess occurred in one case. Paraplegia of a mild type and of short duration occurred in three instances. The ages of the patients ranged from four to forty years, and the proportion of cases occurring among females was somewhat in excess of the number in males, viz., thirty-eight of the former to twenty-seven of the latter.

The disproportion in the number of these cases in which the disease occurred in the earlier years of life, as compared with those who had reached adolescence and adult life, was very marked—*e. g.* there were two cases aged three and four years respectively; between six and twelve years there were fourteen cases; there were sixteen cases between the ages of thirteen and nineteen years; while from twenty to forty years of age there were thirty-three cases.

In early life the more rapid development of the disease, as compared with its rate of progress in the adult, accounts in a measure for the relative infrequency with which the disease was seen in its early stage in childhood.

In the adolescent and adult patient the duration of the early stage was frequently estimated to have been twelve and eighteen months. In this class it is the slow rate with which the disease generally acquires its characteristic features that affords such excellent opportunities for its early recognition.

Recumbency as a method of treatment in the early stage of the disease demands attention in this connection, for the reason that if properly carried out it meets all the indications for treatment.

By this plan the maintenance of spinal rest may be secured in a high degree, owing to the removal of the entire weight from the vertebræ. Dorsal decubitus strictly maintained will cause the distortion to disappear in the course of a few weeks. To accomplish this, however, the patient should lie upon a recumbency frame, and be restrained from turning and twisting by a broad girdle passing around both the trunk and frame; in addition traction may be applied to both head and feet. To employ recumbency in an imperfect manner is next to useless; and to employ it as an exclusive method of treatment during the time that spinal rest is indicated is impracticable, and often detrimental to the general health of the patient. It is a useful and often necessary adjuvant in connection with other methods, and as such should find its chief employment. A good plan, when the plaster-of-Paris jacket is to be used, in a case of early Pott's disease, is first to subject the patient to a course of recumbency treatment of four or five weeks' duration. This will cause the distortion to disappear; the spine will then be in a straight position during the act of suspension and the application of the plaster-of-Paris jacket. A jacket so applied should be cut open in front and be provided with lacings, to guard against any loosening that may ensue after it has been worn for a short time.

With our present knowledge, the hope of diminishing the disastrous consequences of Pott's disease lies chiefly in the direction of early diagnosis and prompt treatment. If the effort to better this branch of our knowledge were commensurate with the energy that is expended in the attempts to relieve patients in whom the advanced stage of the disease has been reached, the course of events might be reversed. It might then be as much the exception to see this disease in its developed forms, as it is now the exception to have the opportunity to treat it in its earlier stage. Especially should the effort be made to anticipate the occurrence of angular deformity in children. The frequency of the disease at that period of life, and the rapidity with which it reaches an advanced stage of development, and also the readiness with which the disease will yield to treatment, are only a few of the reasons that can be adduced in this connection. Much undoubtedly could be accomplished simply by the exercise of greater care and discrimination by physicians when examining patients whose symptoms give rise to a suspicion of this disease. Under

such circumstances, if they would be distrustful, rather than over-confident that the spine is not implicated, the error of overlooking the early stage would occur with less frequency. In this connection there is a large opportunity for missionary work of a valuable character among the poorer classes, with the view of counteracting the evils which attend the delay in beginning treatment in these forms of tuberculous disease. With a little instruction this work could be effectively done by those who labor systematically among the poor, *e. g.*, the city missionary, the district nurse, instructors in free kindergartens, matrons of day-nurseries, etc. The opportunity to recognize the beginnings of disease of this type would often be afforded these persons long before the parents of such patients would think it necessary to take the child to a dispensary or elsewhere for assistance. Touching the treatment which this class of patients demands, there are no wants which are not easily accessible for all. Their chief want is the knowledge to understand the importance of giving such cases proper treatment at the earliest possible moment.

ON POTT'S DISEASE IN THE OLD.

By HOWARD MARSH, F.R.C.S.,
LONDON, ENG.

I FEEL myself highly honored by your permission to offer a short contribution to the discussion of which Pott's disease is the subject at this great Congress; and, besides, I take an especial interest in the present occasion, as I am a disciple, however unworthy, and in a surgical sense the lineal descendant, however degenerate, of the surgeon who drew prominent attention to the disease before us upwards of a hundred years ago at St. Bartholomew's Hospital, and whose name has ever since been associated with it. Would it were possible, and personally safe, for me to search out and inform my revered predecessor of your proceedings. Little did he anticipate that more than a century after his day a whole army of pathologists and surgeons, drawn from every quarter of the globe, would meet in one of the most renowned cities of the New World to compass the disease about on every side and lay its powers of mischief even with the ground.

I venture to think that the plan you have adopted of selecting one of the most important and widely disseminated maladies met with in orthopedic surgery for an exhaustive examination is typical of the best work that can be done at these periodical congresses.

My remarks will be limited to a single point which I think is not down for notice by any other speaker, viz., the occurrence of Pott's disease in the old; but I may, by way of preface, refer very briefly to the general question of the incidence of surgical tuberculosis at different periods of life. I believe all are agreed that tuberculosis commences in a large majority of cases between the ages of three and ten. It may, however, be developed at an earlier period; thus, I have seen several instances of Pott's disease in infants under the

age of a year, and at least two in infants under eight months. It may also occur, though more and more rarely as years advance, at any subsequent period of life up to extreme old age. I have seen three pregnant women, aged respectively twenty-six, thirty-two, and forty, and an unmarried woman of forty-three, all with Pott's disease in the lower dorsal region. Of these patients, one had psoas and another lumbar abscess; a woman of forty-two with extensive tubercular disease in the cervical glands; a man aged forty-eight who had tubercular hip disease, which suppurated; and a woman of fifty-five who developed acute hip disease, rapidly suppurating, and who died of phthisis. It is worthy of notice, that probably because these affections are by many supposed not to occur after early adult life, the nature of the disease, in several of these cases, had in their early stages been overlooked, while one patient was still being treated for chronic rheumatism, though she had well-marked angular deformity and a prominent lumbar abscess. But I must not omit to say that all this was English and not American surgery. At a later period still—that is, in persons over sixty—surgical tuberculosis, though with increasing rarity, is occasionally met with. It will be remembered that in 1865 Sir James Paget wrote a paper on "Senile Struma," in which he remarks that, in his belief, people over sixty are more often scrofulous than those between thirty and fifty, and he adds that there is not one of the so-called seats of election of scrofula in the young—lymph-glands, bones, joints, the spine, the testis, and other parts—in which he has not seen the disease in people over sixty. My own experience entirely agrees with that of Sir James Paget. I have seen in the last four years in the out-patient room at St. Bartholomew's Hospital the following cases: tuberculous disease affecting the metacarpal bone of the thumb in a man aged sixty-four; affecting the tarsus in a woman aged sixty-eight; affecting the testis in two men, the one seventy-one the other seventy-three, and affecting the lymphatic glands of the neck in two men aged respectively sixty-three and sixty-seven. In all these examples suppuration had occurred. Two of the patients also had phthisis. Last July, in St. Bartholomew's Hospital, I had charge of a man aged sixty-three, who I thought, when I first saw him, had osteo-arthritis of the right knee. The joint, however, gradually became flexed and the synovial membrane

thickened and pulpy, and a cold abscess formed over the inner condyle. This burst spontaneously through the skin, which had become thinned and red, and it left a sinus discharging caseous pus. The patient had a cavity in the apex of his right lung. In the Museum of the Royal College of Surgeons there is a specimen described as follows: "A hip-joint in which, after the head and upper part of the neck of the femur had been destroyed by ulceration, the shaft was drawn up so that the remains of the neck rested upon the ilium just above the brim of the acetabulum. The capsular ligament has been removed, the acetabulum is filled up with fibrous tissue. The walls of the femur are thin and light. From a woman aged seventy. Ten years before her death she had apparently scrofulous disease of her hip. Abscesses communicated with the joint and opened in the groin, and the limb became much everted and shortened. The parts, however, ultimately healed. The patient died of apoplexy. After death her lungs and liver were found tuberculous." Among cases, not very rare, in which such joints as the wrist, elbow, and ankle, in persons over sixty, become, without obvious cause, the seat of inflammation which is attended by suppuration and rapid disorganization, rendering amputation imperative, some at least are, in all probability, tuberculous, but I cannot adduce any positive proof of this, as I know of no instance in which an adequate examination has been made.

Of all the forms of tuberculosis in persons over sixty, however, Pott's curvature is, in my experience, the most rare. I have only four examples to quote.

I. A man, aged sixty-five, but whose hair was completely white and who was wasted and looked over seventy, was in St. Bartholomew's Hospital five years ago with the following symptoms: slowly developing stiffness of the upper part of the cervical spine amounting in the course of four months to almost complete rigidity, so that he could neither nod nor rotate his head; pain radiating over the occipital region, and severe pain on any movement of the spine, to avoid which he walked slowly and cautiously, and sat resting his chin on his hand, and in turning round or getting up in bed, held his head, as children will, between his hands. On examination the spinous processes of the upper cervical vertebræ were found irregular and displaced somewhat to the left side, while the nape of the neck

was widened and thickened by marked swelling on either side, but chiefly on the left of the middle line. A firm leather collar resting on the shoulders and cup-shaped above, so as to support the head, was applied, and he was kept as far as possible at complete rest. A month later an abscess formed on the left side of the spinous processes. This was opened and about an ounce of caseous pus was removed. The patient gradually lost flesh and grew weaker, and when he left the hospital, two months later, the disease was evidently advancing. His head had settled forward and to the left, and his spine was quite stiff. About two drachms a day of flaky pus escaped from the sinus, which showed no tendency to close. Throughout, the temperature ranged from 99° to 101°. I did not see him again.

II. A patient, aged sixty-four, was in St. Bartholomew's Hospital under Mr. Butlin, about four years ago with disease of the cervical spine, attended with deformity, stiffness, severe pain, and prolonged suppuration. I saw the case at the time, and it appeard to me that Mr. Butlin's view, that the disease was tuberculous, was certainly correct.

III. In the College of Surgeons, London, there is a specimen consisting of the cervical vertebræ of Dr. Buckland, a former Dean of Westminster. The osseous structure of the lateral masses and adjacent parts of the atlas and axis is deeply eroded and excavated, and the two bones are displaced in relation to one another. Thus the appearances exactly accord with those that are found in caries of the spine in childhood. The Dean at the time of his death was seventy-two. He died of general weakness and melancholia, and the spine disease was not suspected during life.

No statement is made in the museum catalogue as to the nature of the disease, but I think there can be no reasonable doubt that it was tuberculous.

IV. In his *Studies of Old Case-books*, p. 39, Sir James Paget has recorded a case of Pott's disease in a gentleman, aged fifty-five, attended with angular curvature.

In conclusion, I feel that I ought to state the grounds on which I regard these cases as examples of tuberculous disease, for I may be asked, Is it certain that they were of this nature? I suppose that the diagnosis must lie between tuberculous disease and osteo-arthritis.

That these cases were not osteo-arthritis is, I think, indicated by the following facts:

1. These patients did not present that disease in any other part.
2. I am not aware that osteo-arthritis produces angular curvature.
3. Many of these cases suppurated—a result very rare in osteo-arthritis.
4. So trustworthy an observer as Sir James Paget states that he has himself met with tuberculous disease of the spine in old subjects.
5. There can be no doubt that tuberculous disease of other parts is by no means very rare in the old.
6. These cases are exactly similar to cases of tuberculous disease of the spine as we see it in the young.

THE PREVENTION OF UNNECESSARY DEFORMITY IN POTT'S DISEASE.

By ROYAL WHITMAN, M.D.,
NEW YORK.

The necessary deformity of Pott's disease is that which cannot be prevented by the most efficient treatment, applied before the stage of deformity and continued until an absolute cure is established.

It is my impression that not more than five per cent. of all cases are seen by us before the deformity stage, and in out-patient practice, at least, even these are usually brought directly by the mothers, not on the advice of a physician. What the unavoidable and what the unnecessary deformity of Pott's disease may be, we cannot therefore at present determine.

Believing, as I do, that in most instances we are able by efficient treatment to prevent an increase of the already existing deformity, which untreated would become more and more pronounced, it seems fair to assume that much of the almost universal deformity seen in our clinics is unnecessary.

I do not propose, however, to attempt to justify the title of this paper, as was my original intention, but shall simply present a suggestion for treatment in a limited class of cases, by which possibly a certain amount of unnecessary deformity may be prevented. In this class the site of the disease, often subacute in character, is the middle dorsal region. Head-supports are not indicated, by the symptoms at least, yet there is a tendency to increase of the deformity. The chest flattens, the shoulders droop, and the scapulæ become more and more prominent.

As the shoulders droop forward and the ribs sink downward, the greater becomes the weight and forward leverage on the weakened

spine. It has seemed to me that the importance of elevating and holding the shoulders and of restraining the reaching movements of the arms is not appreciated. Such movements are always accompanied by forward flexion of the upper spine, which cannot be prevented by the ordinary applicances. If, however, the shoulders are pressed back to their full limit, the ribs are elevated, the chest cavity increased, and the spine so fixed that flexion is almost entirely restricted to the neck, far away from the seat of disease. To accomplish this object I have made an addition to the ordinary Taylor back-brace as follows: Two saucer-shaped pads of hard rubber are moulded on plaster casts to entirely cover the promi-

Fig. 1.

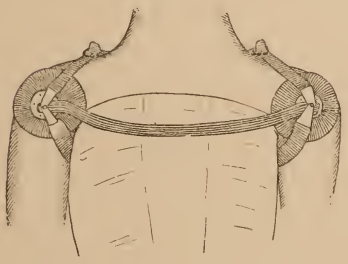
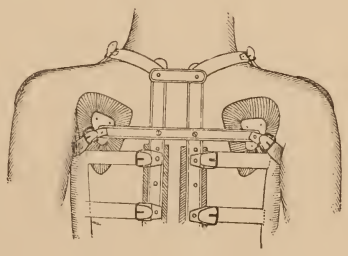


Fig. 2.



nence of the shoulders, resting on the deltoid muscle as it arches over the head of the humerus. These are connected by an unyielding steel bar which crosses but does not press upon the chest.

A cross-bar is attached to the upper part of the back brace, terminating in two triangular hard rubber pads, which cover and hold the scapulæ against the thoracic wall. The brace is then applied as ordinarily, providing efficient pressure by its pads at the point of disease. The shoulders are then brought back to their full limit; the shoulder-pads are placed in position and firmly attached to the brace by a band passing above the clavicle to the neck-piece, while another, thickly padded, is carried through the axilla to a buckle on the scapula-pad, so that the shoulders are firmly held in the desired position.

The backward traction on the shoulders tends to produce lordosis in the lumbar region, but as this is prevented by the abdominal apron of the brace, we are able to provide an increased leverage and

fixation at the point of disease. While the ordinary and necessary movements of the arms are not, to any extent, restricted, the direct forward reaching movements are entirely prevented. The desirability of this restraint is a point that seems worthy of attention in cases of more acute disease, where elevation and fixation of the shoulders and ribs would seem to be indicated. In such cases a chin-support adds to the efficacy of the appliance.

A BRIEF HISTORY OF THE USE OF SUSPENSION IN POTT'S DISEASE.

By BENJAMIN LEE, M.D.,
PHILADELPHIA.

My first lesson in the treatment of Pott's disease was taken from that enthusiast in mechano-therapeusis, Charles Fayette Taylor. I had then been engaged in the general practice of medicine for nearly four years, and had never chanced to meet a case of that disease. If any allusion whatever had been made to spinal curvatures in the lectures of either of the two highly respectable medical colleges which I attended, it was so trifling as to have escaped my attention. To say that I did not know the difference between a lateral and an angular curvature is simply to say of myself that which I presume could have been said of the great mass of graduates in those days of almost purely didactic teaching.

Dr. Taylor relied entirely on the employment of antero-posterior force by means of his well-known splint, for redressing the deformity and inducing ankylosis in Pott's disease. I naturally became a strong advocate of the same idea. Soon after taking up my residence in Philadelphia, however, in the year 1865, in conversation with Dr. S. Weir Mitchell with regard to a little patient whom he had placed under my care, he inquired why I depended solely on pressure in the horizontal plane, and made no attempt at extension. I replied: First, because force exerted in this way was much more efficient than that of extension; and, secondly, because I did not believe it possible to exert any traction worth considering by means of a brace. But, he persisted, if extension cannot be made by means of an instrument worn on the person, why cannot it be satisfactorily accomplished by the employment of apparatus having a fixed point of support distinct from the patient? He then went on to describe

to me the distinguished success with which his father, Prof. J. K. Mitchell, of the Jefferson School in Philadelphia, had treated such cases by means of suspension as long ago as the year 1826. The reasonableness of the suggestion impressed me, and I at once set to work to put it to practical application. The mechanism that I made use of was almost exactly that described by Le Vacher in a contribution to the fourth volume of the *Mémoires de l'Académie Royale de Chirurgie de Paris*, in the year 1768, the difference being that his mechanism was attached to a corset worn on the person, constituting, in fact, the "jury-mast" of Prof. Sayre, while mine had a point of support quite independent of the body, thus utilizing the weight of the body and lower extremities as an extending force, and necessitating no compression of the trunk. It consisted of a simple steel rod bent at a right angle about a foot from its upper extremity, while the lower portion for about the same distance was provided with a ratchet. The upper horizontal arm carried a steel bow and head-sling, while the lower was attached to the back of a chair, a go-cart, a rocking horse, or other piece of furniture, and could be raised and lowered at will by a key in the ratchet. This apparatus I described in a paper which would have received the prize of the American Medical Association for the year 1866 but for the accidental disclosure of the name of the author. It appeared in the *Transactions* of the Association for that year, under the title of "The Correct Principles of Treatment for Angular Curvature of the Spine." This, I claim, was the revival in the present generation of medicine of the use of suspension in Pott's disease, in this country at least; for though, as I shall have occasion to show, both extension and suspension were favorite modes of treatment generations before, the brilliant discoveries and forcible writings of Percival Pott had so powerfully affected the thought of the profession that this, as indeed almost every mechanical method, had been abandoned, and uninterrupted rest in the horizontal posture, together with the extravagant use of setons and issues, had been substituted.

In this essay I considered that there were three classes of cases in which this method formed a useful adjunct to that of the instrument worn. These were: "1st. Those in which the cervical vertebræ are the seat of disease. 2d. Where, for any reason, whether caries of

transverse processes, abscess, ulcers resulting from the use (or abuse) of issues, moxas, *et id omne genus*, hyperæsthesia of the surface, or extreme delicacy, tenderness, and irritability of the integuments, the requisite amount of antero-posterior pressure cannot be borne, save for a limited time each day; and, 3d. Those cases which, while their destructive progress may have been arrested and the posterior projection somewhat diminished, exhibit a tendency to the phase of deformity denominated *lordosis*."

Fig. 1.

Direct suspension. Lee, A. D. 1865. Transactions of the American Medical Association, 1866.

A more extended experience soon convinced me, however, that, while suspension had indeed a peculiar applicability to these classes of cases, there was no phase and no stage of the disease in which it could not be employed to very great advantage. Thus far my extension had been entirely passive, the patient taking no part in producing it, and adjustment by an assistant through the medium of a ratchet being necessary (Fig. 1). The little patient alluded to had by its use entirely recovered from complete paralysis of the muscles of the trunk and lower extremities, and had arrived at a better condi-

tion of general health than he had ever before enjoyed, and I was now anxious to devise some plan for improving the shape and increasing the capacity of his thorax anteriorly and superiorly, and diminishing the prominence of the lower end of the sternum. Observing, one day while revolving this problem, that he occasionally took hold of a rod which carried the head-sling and drew

FIG. 2.

Self-suspension by means of Dr. Lee's spinal swing, A. D. 1866. Medical Society of the State of Pennsylvania, 1870. Philadelphia Medical Times, 1870.

himself up toward it by his hands, in order to relieve his chin from pressure, it occurred to me that if, instead of this adjustable rod, I should substitute a cord passing over a pulley attached at some distance above the head and put the other end of the cord in his hands, I should place the counter-extension under his own control, thus giving him an opportunity to relieve the pressure on the chin at will, at the same time dividing the traction equally between the arms and

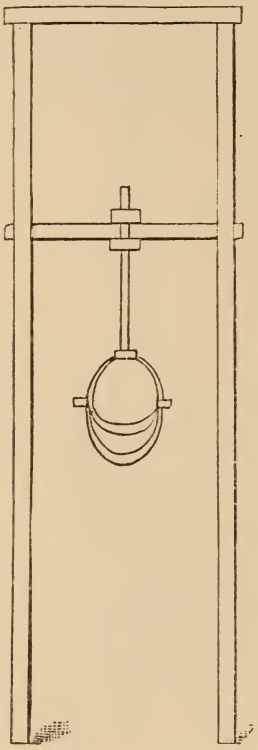
the neck, instead of having the entire weight supported by the latter. I immediately had an apparatus made on this principle, which I denominated the *spinal swing* (Fig. 2); and the ease, and even eagerness, with which the little fellow at once made use of it assured me that, as far as the comfort and enjoyment of the patient were concerned, the modification was one of great importance. Nor was I disappointed in regard to the more permanent advantages which I hoped to reap. The distortion of the thorax soon began to show signs of improvement. Its development superiorly increased, his respiration became more easy and free, his blood was better aërated, the tumid abdomen subsided, and the muscles of the arms and upper part of the trunk increased in volume. As there was a tendency in his case to lateral deviation, I attempted to remedy this by placing two wooden ovals on the cord at uneven distances above his head, and causing him, for a certain length of time each day, to suspend himself by taking hold of the higher oval with the hand corresponding to the depressed shoulder, and of the lower with the other hand, hoping in this way to reverse the lateral curve. This proved so effective that I was led to adopt the apparatus in the management of true lateral curvature, and was greatly pleased to find that I had added a new and valuable mechanism to our means of correcting this obstinate form of deformity. The patient referred to above I had the pleasure of presenting before the Medical Society of the State of Pennsylvania four years later, at its session in the city of Philadelphia in the year 1870, all paralytic symptoms having long before disappeared.

While, therefore, I ask you to unite with me in ascribing to Dr. John K. Mitchell, a physician of unusual sagacity, and possessed of the faculty of the scientific use of the imagination to a degree almost prophetic, a man whom as my former teacher I delight to honor—in ascribing to him, I say, the credit of having introduced in this country the treatment of Pott's disease by suspension (Fig. 3)—I desire to distinctly claim for myself whatever honor may attach to having been the first to propose and use *self-suspension* in the treatment of Pott's disease, of lateral curvature of the spine, of spinal pressure paralyses, and of the condition known as spinal irritation.

The essay just alluded to was published in book form by J. B. Lippincott & Co., of Philadelphia, in 1867, together with others on the same subject, under the title of *Contributions to the Pathology,*

Diagnosis, and Treatment of Angular Curvature of the Spine, and again by the same firm in 1872, together with a paper on "Modified Suspension," read before the Medical Society of the State of Pennsylvania in 1870, and published in the *Philadelphia Medical Times* of the same year.

Fig. 3.



Mitchell's spinal suspensor. Professor John K. Mitchell, A. D. 1826.

In 1876 the American Medical Association met in the city of Philadelphia, and Dr. Lewis A. Sayre presented his then new suggestion of the treatment of Pott's disease by means of the plaster jacket. It was a pleasure to me to be able to aid in his demonstration of this brilliant and admirable invention, by having the spinal swing which had been for ten years in use in my treatment-hall set up at the hall in which the surgical section met, for that purpose.

During the same summer I had a spinal swing on exhibition in the surgical section of the Centennial Exposition.

As is well known, Dr. Sayre was not content to rest on his well-earned laurels in the field of angular curvature, but proceeded to apply the same principle to the treatment of lateral curvature as well, making a report on the subject to the New York Academy of Medicine in March of the year following. In this report he referred to Dr. J. K. Mitchell as the inventor of self-suspension. I at once addressed him a note congratulating him on his successful results, but at the same time calling his attention to the error into which he had fallen. To this he courteously replied as follows:

"285 Fifth Avenue, New York, May 17, 1877.

"My dear Doctor: I sincerely regret that I should have done you any injustice in my Report on Rotary Lateral Curvature before the Surgical Section of the New York Academy of Medicine. It was altogether unintentional, I assure you, as I was not aware that you had modified the plan of Dr. Mitchell by self-suspension, which I think the most important part of the treatment, and shall hereafter give you full credit for being its originator. I was unfortunately absent from the meeting in Philadelphia when you made the demonstration, and I understood you to say afterward that you had got the idea from Dr. Mitchell, and in this way I was led into error, not knowing that you had modified his plan. Your paper in the *Medical Times* of 1870 was published when I was abroad, and I unfortunately had not seen it until the copy you sent me to-day.

"For the privilege of making this correction, which I do most cheerfully, I am very much obliged.

"Yours very truly, Lewis A. Sayre."

This correspondence appeared in full in the *New York Medical Record* of May 26, 1877. The same year I presented a paper before the American Medical Association, under the title of "Suspension as a Means of Treating Spinal Distortions," in which I described the different forms of suspension—vertical, oblique, and horizontal—at some length, and reported cases of spinal paralysis and spinal irritation, without deformity, successfully treated by self-suspension.

At the meeting of the Medical Society of the State of Pennsyl-

vania in the same year I read a paper on the "Diagnosis of Psoas Abscess," in which I detailed a case successfully treated by suspension, and which concluded as follows: "This result, I consider, sufficiently bears out the statement with which this paper opened, that the case possesses an intrinsic interest as indicating the value of mechanical treatment, and especially, I may add, of suspension in spinal affections."

Before the same Society, in 1879, I presented the subject of "Horizontal Extension for the Purpose of Applying the Porous Felt Jacket for Curvatures of the Spine," which I prefaced in this way:

"It is now nine years since, at a meeting of this learned body in the city of Philadelphia, I had the honor of bringing to your notice the then novel procedure of self-suspension under the designation of 'Modified Suspension,' as a means of remedying curvatures of the spine, and of practically demonstrating before you the ease with which the operation could be performed and the entire confidence with which patients of widely differing ages and of varying forms of disease and distortion were ready to undertake it. Since that time (and I may say, indeed, for three years previous) the spinal swing has been in daily use in my treatment-hall, as well as in the homes of numerous patients, and my anticipations of the benefit to be derived from its use have been more than realized. While the relief which it gives from the agonizing pains or wearying unrest of spinal caries is so immediate and remarkable as to compel attention, and to have led me at first to confine its use to that class of deformities, its adaptability to the treatment of true idiopathic lateral curvature is not less positive."

I again addressed the American Medical Association on this subject in 1880, in a paper entitled "Spinal Extension: Its Modes, Means, and Motives." From this paper I beg leave to quote briefly:

"Extension of the spinal column, like most brilliant modern discoveries in medicine and surgery, is at least as old as the 'Old Man of Cos.' Mechanical therapeutics, which, under the paralyzing influence of the mysticism of the middle ages—an influence from which the profession is still struggling to emancipate itself—was consigned to an inferior and most degraded position, was indeed highly prized by his acute and profound intellect. Not only as a means for treating affections themselves mechanical in their nature,

such as the various deformities, but as an agent for the relief of manifold disorders dependent upon or accompanied by blood-stasis and exudations, he assigns to mechanical therapeusis the very highest rank as a method of medicine, both on scientific and on experimental grounds.

"The modes in which spinal extension may be practised are three: vertical, inclined, and horizontal."

The means for carrying out these different modes, which have been or are still in use, I will briefly glance at under the same heads.

First, vertical extension: The earliest apparatus which we find noticed for this purpose is described in Hippocrates in treating of *succussion* as a means of rectifying spinal curvatures. It made use of the weight of the body as an extending force with the superaddition of a powerful momentum. It was certainly a heroic mode of treatment. His advice was that when the disease was situated high up in the spine succussion should be performed with the feet downward, in order to secure a greater extending weight; but when in the lower part of the column with the head down, for the same reason. He describes the mode of attaching the patient to the ladder with a minuteness of detail which shows him to have had practical acquaintance with the method. I call your attention to this drawing illustrating the process, not simply as a matter of historical curiosity, but with a view to relieving the apprehensions of those who hesitate to adopt the gentler modes of extension which I advocate.

You notice that the apparatus consists of an ordinary ladder somewhat longer than the patient. Hippocrates directs that it should be "padded with leather or linen cushions laid across and well secured to one another, to a somewhat greater extent, both in length and breadth, than the body will occupy." The patient is then to be laid on the ladder upon his back, and the feet at the ankles are to be fastened, at no great distance from one another, to the ladder. He is to be similarly secured above and below the knees and at the nates. The arms, as you see, are strapped to the body. "When you have arranged matters thus," he says, "you must hoist up the ladder to a high tower or to the gable-end of a house." When raised to the requisite height it was allowed to come down by the

run, a firm piece of ground being carefully selected to receive it. It is pretty clear that "something must give" in the due performance of this operation, which, however, notwithstanding its apparent danger, continued to be practised until the middle of the sixteenth century. It certainly afforded convincing evidence of the wonderful strength of the spinal ligaments.

Less violent methods of vertical extension were later employed. Among these, perhaps, that best worth noticing is the "spine elongator" of Mr. R. A. Stafford, of London, author of *Two Essays on Diseases of the Spine*. He says in treating of lateral curvatures: "Lateral exercise, however, will not always recover a lateral curvature. The spine is sometimes so completely distorted and the vertebral column so entirely thrown out of the centre of gravity that the muscles have lost their power. They are so stretched on the convex and so contracted on the concave side of the curve that they cannot act. In such cases lateral exercise will not alone be sufficient. More must be done. The spine itself must be elongated, and the best method of accomplishing this is by gravitation of the body. To effect this object I have invented a machine by which the patient can be raised up from the ground by the upper part of the body, while the lower part hangs suspended. Hence the lower part, by its own gravitation, and by additional weights being hung around the hips, gradually elongates the spinal column until it becomes nearly, if not quite, straight for the time being."

The same writer refers to the use of apparatus for stretching the spine by Delpech and Jalade-Lafond. Extension was made both in the erect (sitting) and horizontal postures, the hips being fixed and the traction being exerted both on the head and the axilla.[1]

Previous to him, Sheldrake,[2] who flourished in London in 1816, employed extension by means of an apparatus worn upon the person.

John Shaw[3] published his observations in London in 1825, and gives an illustration of horizontal extension by the hips and head and axilla, as in use at the Orthopedique in Paris in his day.

[1] A Treatise on the Injuries, the Diseases, and the Distortions of the Spine. By R. A. Stafford, M.R.C.S. London, 1832.

[2] A Treatise on Diseased Spine, and on Distorted Spine. By T. Sheldrake, London, 1816.

[3] Further Observations on the Lateral or Serpentine Curvature of the Spine. By John Shaw, London, 1825.

Bampfield,[1] writing the year before, says: "In the erect state of the body the spine can be stretched by swinging by the head or by the hands."

It was not far from the same time that Glisson made use of suspension by the head, adding to his extending force by attaching weights to the feet. That versatile genius, Darwin, in his *Zoönomia*, describes an apparatus of his own invention for producing spinal extension in the horizontal position, but does not seem ever to have put it to practical use.

Darwin's bed, *Delpech's couch*, and *Cole's orthopedic sofa* were all examples of apparatus for horizontal extension.

Verrat's prone couch, *Shaw's inclined plane*, *Sheldrake's inclined bed*, and *Harrison's spinal couch* all made use of the force of gravitation modified by the intervention of the inclined plane.

Fig. 4.

Spinal swing, with folding tripod. The tripod folded is seen on the left. Lee: American Medical Association, A. D. 1880.

Thus it will be seen that during the ten years preceding its introduction into this country by Mitchell there had been a *renaissance* of spinal extension in its different forms, both in England and on the Continent. So far as horizontal extension goes, however, all of these authors were imitators of the great Ambrose Paré, whose work

[1] An Essay on Curvatures and Diseases of the Spine. By R. W. Bampfield, London, 1824.

on *Surgery* was translated into English in 1665. He in turn adopted it from Hippocrates, who described its mode of application with great minuteness. It was performed, as will be seen in this drawing, by manual force, a bandage being carried around the chest under the axillæ, and another around the hips, and traction being made on these at either end of the table by a stout attendant, while the physician himself made pressure downward upon the projecting vertebræ. Paré says that "unless extension be made, restitution is not to be hoped for."

At the meeting of the same Association in 1880 I exhibited a spinal swing with folding tripod, as depicted in Fig. 4, and also an extension-table designed for taking a plaster cast of the trunk in the horizontal posture without the use of bandages.

Suspension with the back resting upon the convexity of a curved board was proposed by Dr. Charles F. Stillman, in a paper read before the Chicago Medical Society in December, 1889.

The discovery of J. von Motschutkowski, of Odessa, in 1883, while using suspension in a case of Pott's disease complicated with locomotor ataxia, or tabes dorsalis, that this latter affection was benefited in a marked degree by the operation, is fresh in all your minds. Introduced to the knowledge of Charcot by M. F. Raymond in 1889, it became a nine days' wonder on both sides of the Atlantic, as the papers of Drs. William J. Morton, C. L. Dana, and Edward Waitzfelder in the *Medical Record* of New York, and of Dr. S. Weir Mitchell in the *American Journal of the Medical Sciences*, all appearing in the spring of that year, abundantly testify.

While the extravagant claims made for it in this connection have not been fully realized, no one who has carefully followed the literature of the subject can doubt that suspension is capable of producing such an amount of stretching of the spinal cord and its membranes as to profoundly modify its circulation and its nutrition. The paper of Dr. Mitchell, *patris insignis filius insignior*, is entitled "Treatment of Pott's Paralysis by Suspension," and is founded upon three cases recently treated by him.

His conclusions are:

"That suspension should be used early in Pott's disease;

"That, used with care, it enables us slowly to lessen the curve;

"That in these cases there must be in some form a replacement of the crumbled tissues;

"That, unless there is great loss of power, the use of the spine car or chair, etc., of John K. Mitchell enables suspension, especially in children, to be combined with some exercise;

"That no case of Pott's paralysis ought to be considered desperate without its trial;

"That suspension has succeeded after failures of other accepted methods;

"That the pull probably acts more or less forcibly on the cord itself, and that *the gain is not explicable merely by obvious effects on the angular bony curve;*

"That the now well-known influence of extension in Pott's palsy makes it probable that in other forms of spinal disease not due to caries, extension in various forms may be of value, as has apparently been of late made clear;

"That the methods of extension to be used in these and in carious cases may be very various, only provided we get active extension;

"That the plan and length of time of extension must be made to conform to the needs, endurance, and sensations of the individual cases."

I presume that few of us would dissent from these propositions, but as orthopedists we should add to them the following:

That in all cases of paralysis accompanying or resulting from spinal caries the use of some form of mechanical support or splint in conjunction with suspension will enable us to arrive at a successful result more rapidly, more surely, and more perfectly.

In conclusion, I must apologize for the predominance of the personal element in this sketch; which, however, seemed unavoidable.

If anyone else, in ransacking the medical archives of the past, has succeeded in discovering the use of self-suspension as a treatment for spinal affections at a time prior to my introduction of it, I shall be only too ready to acknowledge my error, and accord the merit of the suggestion to the first originator.

RECUMBENCY IN THE TREATMENT OF POTT'S DISEASE.

By AP MORGAN VANCE, M.D.,
LOUISVILLE, KY.

The anxiety on the part of most orthopedists to be brace-makers and brace-fitters often makes them overlook the great good to be derived from the recumbent posture in many cases. All of us meet cases that fail to do well despite our best efforts; they either continue to have pain, or have a set to one side or the other, or will not tolerate the head-support, or have parents who will not conduct the brace treatment properly. I have been gratified by rapid results in a number of instances where prolonged recumbency has been practised. My attention was called to this very forcibly on several occasions by noticing the rapid consolidation in cases where paralysis came on early, where absolute quiet on the back was enjoined; and in several cases where intercurrent diseases have kept the children recumbent, I am sure I have seen more rapid improvement in the bony lesion.

Particularly do I wish to speak of those cases where a tendency to lateral deviation appears early, and, despite our ingenuity in fitting the brace, continues and becomes confirmed in this position. I invariably put these to bed for six weeks to two months, with daily massage to extremities, and forced feeding, often with the happiest results. Again, a case will present, a brace is fitted, but the child does not respond—continues to be fretful, and to give evidence that the irritation has not been relieved. I put these cases to bed under the same treatment, sometimes with the brace, and sometimes without. Another class are the big-headed youngsters, and those who will not properly use any of the head-supports. A period of recumbency is often the turning-point in these cases; particularly is this the fact if

you have to trust to the ordinary parent to attend to the head-support; they will invariably indulge the child, and your case goes wrong. You nearly always have a protest from the parents and family doctor about the child's general health—breaking down, growing thin, and so on. I have yet to see one that did not get fat and improve in a general way; especially is this true if massage is faithfully kept up. There are other points that might be brought up proving the utility of recumbency in many phases of this disease, but I think I have said enough to make a point for discussion, and that is all I desired to do.

EXTENSION IN BED IN THE TREATMENT OF CARIES OF THE SPINE.

By CHARLES C. FOSTER, M.D.,
CAMBRIDGE, MASS.

Previous to 1864 any attempt to straighten or extend a carious spine was generally condemned; although surgeons had unintentionally produced a certain degree of extension by the use of spinal supports and by keeping the patient on his back in bed. Some of the earlier orthopedists had tried extension systematically but unsuccessfully.

It was believed that the diseased vertebræ would not consolidate unless in close contact.

But in 1864 Dr. Buckminster Brown began to use extension; at first chiefly for the relief of pain—a point learned in the treatment of hip disease. Soon, however, he found that when the diseased surfaces were held apart and prevented from grinding upon each other the amount of inflammation and suppuration was much lessened. He also found that, in spite of all said to the contrary, Nature would fill up the spaces left vacant between the partially destroyed bodies of the diseased vertebræ with new material, and cure the case with a comparatively straight spine instead of a very crooked one.

He found that if extension be applied early, serious curvature should seldom occur; if it has already occurred it may often be considerably reduced.

Extension, by straightening the curved portion of the spine, and thereby enlarging the calibre of the spinal canal at that point, should theoretically tend to relieve the pressure-paralysis of caries. Practically, we find that the paralysis does improve very rapidly under it. The spasmodic twitching of the arms and legs disappears;

the motive power, the activity of the bowels, and the normal sensation return.

The relief of pain is very great, both of the local bone-pain and of the transmitted nerve-pain. Improvement in temper follows naturally upon increased comfort.

Until recently Dr. Brown was, I believe, the only man who habitually and successfully used extension. A few years ago the method was brought to the attention of surgeons through a paper by him in one of the medical journals. It was tried extensively in New York, and is now, I think, very generally adopted there, though I fear its full value and wide applicability are not yet fully appreciated.

Practical Application.

Extension is most easily applied, and produces its most striking results in caries of the cervical region. The method of application is as follows:

The patient lies on his back on a firm mattress, the head resting upon a *very thin* pillow. For a child of two or three years a pillow one inch thick is sufficient. The patient is steadied by sand-bags laid alongside both head and body. On his head he wears a Sayre suspension-strap, from which a cord runs over a pulley at the head of the bed, ending in a weight, which should be very light; one-quarter to one-half pound is enough for a young child at first. This may be gradually increased to a maximum of one to one and a half pounds.

This seems very light, but it is sufficient, and does its work better and more comfortably than a heavier weight.

The head of the bed need seldom be raised, for the patient's tendency to slip down usually counteracts any opposite action of the weight.

When once thus established in bed, the patient's head will not again be raised, either by himself or by others, for several months. He may be occasionally turned on his side by the nurse for a change; the head being always carefully turned *with the body* by another person to prevent any twisting of the neck. He is never allowed to either raise or turn his head himself. He can be perfectly well fed, bathed, dressed, tended, and amused while thus under restraint. The bed-pan is, of course, constantly used; but

for young children a common tin dust-pan is sometimes better, as it necessitates less lifting of the patient. Cloths laid in it will absorb the urine completely.

The deformity in cervical caries is largely caused by the contraction of muscles irritated by neighboring suppuration. The head not only droops backward or to one side, but is firmly held there. Sometimes, when the head is drawn backward, you can scarcely get your finger between the occiput and the back.

The twitching of the affected muscles causes a higher degree of irritation than I have ever seen in caries of other regions of the spine; the patient is fairly wild from the constant "nagging," and his temper is simply awful.

A very light weight, acting constantly, soon relieves this condition. Within twenty-four hours the patient begins to appreciate the relief from pain, and will lie for months without once trying to lift his head. The distorted neck slowly straightens, seeming to greatly increase in length, the weight being increased an ounce or two at a time; while the rapidity with which the temper improves is astonishing. One father, in writing of his child, said: The moral regeneration is as wonderful as the physical resurrection."

I consider cervical caries, on the whole, the most satisfactory form of the disease to treat if handled in this manner. The tendency to recovery is generally good. Abscess is certainly no more frequent than in other forms. Paralysis is, I think, rather less common; though when it does occur it is often very extensive and severe. The general exhaustion is usually not extreme. Improvement once begun is usually constant and rapid; and the change from a down-hill to an up-hill course almost abrupt. The effect upon the family and friends is all that could be desired. Cases can usually be cured with but little deformity and with very good mobility. If, however, one or two upper dorsal vertebræ be involved, as well as the lower cervical ones, the case will probably be more troublesome.

The special danger in cervical caries is dislocation or fracture of vertebræ. The cervical vertebræ have no large lateral and spinous processes which are exempt from disease and constitute of themselves a pretty strong column. They are, especially the upper ones, little more than mere rings of bone, and everywhere liable to disease.

I have in mind a case in point. The patient was a man, twenty-

seven years old. The disease had existed for some time untreated. The patient had not been confined in bed. One day he over-exerted himself in trying to open a window, afterward lying down on a sofa, his head resting on the arm at the end. Suddenly he felt a sharp pain in his neck, and heard something crack there. At the same time his head was drawn to the left, causing great pain. Dyspnœa and convulsions, alternating with rigidity, at once began, and lasted several hours. Later, he was able to walk across the street to his home, where he had more convulsions. A week later paralysis came on; beginning in the arms, and extending until power was entirely lost in all voluntary muscles of the body except those of the eyes and mouth, and was diminished even in those muscles. The mind was never affected. He died about two months after the accident. The autopsy showed fracture of the odontoid process of the axis.

The moral is obvious: Keep up extension until the spine is firmly consolidated and all such danger is long passed.

A cheap and fairly good substitute for the Sayre strap can be made of webbing; it consists of an occipital strap running from ear to ear, then continuing horizontally around the forehead; another strap runs from ear to ear over the top of the head, and to this the cord for making extension is attached. This strap holds perfectly; but encircling the head, as it does, it causes an uncomfortable compression if much weight be used. I have known it to produce considerable œdema of the scalp. It also tends to tilt the head forward more than is generally desirable. In cases where the head is drawn far backward this action might be useful. This strap could not become displaced so as to press upon the throat, as the Sayre has been accused of doing—unfairly, as I think, for if the chin-piece of the Sayre be made sufficiently cup-shaped it remains in place perfectly and does most excellent work.

When the patient is ready to get up, some efficient head-support must be provided. Personally, I prefer a well-fitting collar, which distributes the weight of the head over the shoulders and chest, to any jury-mast system. It should support both chin and occiput well. The first collar should be high, and should restrict, as far as possible, the rotation of the head. Later ones may be lower and may allow more freedom of motion.

It is well to accustom the patient to the change from the extension

he has worn so long by letting him wear the collar for some time in bed; and for a long time it should always be put on while the patient is flat on his back. A patient who has been long on his back must be raised to a sitting position slowly and gently, or he may faint. This tendency passes away in a few days.

If a patient under treatment must travel, he may be put upon a Bradford frame, and extension maintained by means of rubber bands. These do not act quite so smoothly as a weight, but do their work, on the whole, very well. One child thus travelled from Boston to Washington, back to Boston, and then to Portland, Me., with perfect comfort. In the same way the patient can be taken out of doors in fine weather.

In dorsal or lumbar caries the extension is applied by means of well-padded belts around the hips and under the arms. In the case of a child a webbing head-piece holds better than the belt around the chest. In these forms of disease heavier weights are needed than in the cervical form. The action of the weights may be aided by a thin pad laid under the protuberant vertebræ; but this must be used very carefully or trouble will follow.

When may a patient be allowed to begin to sit up?

Be in no hurry! So long as he continues to do well and keep quiet in bed he may as well stay there. When the local tenderness, the local and general pain have disappeared; when the general condition has improved and the patient begins to feel energetic, enterprising, and correspondingly restless, you may consider the propriety of advancing him a stage; but there is no hurry. A child's time is of no value, and it is better to err on the safe side.

The most delicate examination of the condition of a carious vertebræ can be made by palpation. Healthy vertebræ have a certain degree of mobility upon each other; this varies in different spines and in different regions of the same spine. In the active stage of caries, when the joint-surfaces and interposed cartilage of adjacent vertebræ are softened or destroyed, this normal mobility is greatly increased. Later, when repair has begun by the deposit of plastic material about the seat of the disease, it is again reduced. When consolidation is complete it is wholly lost.

Palpation is simple in theory but delicate and difficult in practice. I begin by examining two healthy vertebræ a little removed from

the seat of the disease, but in the same region of the spine. The patient lies on his face and keeps as nearly absolutely still as possible. I fix one of the vertebræ to be examined by placing the end of one thumb upon the point of the spinous process, using considerable force, so as to push the vertebra forward as far as possible, and hold it there. Now I place the other thumb in the same way upon the next spinous process, taking care that the skin between be loose, so that one thumb in moving shall not pull on the other. Now by alternately increasing and diminishing pressure on vertebra No. 2, I make it slide forward and backward on No. 1.

Having ascertained the degree of mobility in this joint, which I will call A, I go on to the next joint, B, between vertebræ Nos. 2 and 3. Here I find about the same degree of mobility as in A. But joint C, between vertebræ Nos. 3 and 4, shows greater mobility, as does also joint D, between vertebræ Nos. 4 and 5; joint E, between vertebræ 5 and 6, shows normal mobility.

A	B	C	D	E	F
1 | 2	3 x | 4 x	5 x | 6	7		

These observations tell me that three vertebræ, Nos. 3, 4, and 5, are carious; No. 4 on both joint-surfaces, and Nos. 3 and 5 on a single surface each—that in contact with No. 4.

Of course, any number of vertebræ may be diseased; but they can be, in most dorsal and lumbar cases, easily located and counted. In cervical cases this is more difficult.

This test is one that I have never seen mentioned in any book or article. I learned it of Dr. Buckminster Brown. It is very delicate and valuable, but demands both practice and patience for its successful use. In a doubtful case one may have to palpate a spine on several different days before forming an opinion. In the very early stages, before the joint-surfaces are destroyed, I doubt if palpation would be of any assistance. At this time any curve that may exist is likely to be directed forward rather than backward, being caused by the primary swelling of the joint-surfaces and intervertebral cartilages. This is slight, but may cause an exaggerated throwing back of the shoulders, making the patient walk like an ambitious recruit who has not learned to draw in his stomach.

This paper is entitled "Extension in Bed," because I believe bed to be the proper place for such cases during the active stage of the disease and until the spine has become pretty firmly consolidated. Then, sustained by efficient apparatus, they may begin to get up.

Out of bed I do not believe that either as efficient extension, as great reduction of deformity, as complete rest to the diseased parts, or as constant maintenance of the bones in approximately correct position can be obtained as can be done in bed. I think the pain and bad temper also improve more rapidly in bed than out of it.

I do not suppose that any surgeon will claim that either of these processes are actually assisted or hastened by the patient's walking about. But many will say, "The patient's general health will suffer so much from confinement to bed that the reparative processes will be retarded, and he will, on the whole, get along better if he keeps on foot and out of doors."

To this I take exception. I claim that a patient with caries will thrive in bed if *properly cared for;* also that the reparative processes will go on so much faster that they will bring with them the desired improvement in the general health; and that the final result will be better and more quickly and comfortably attained than if half-way measures have been used in the beginning.

I admit that, like other specialists, we may be in danger of forgetting that we have a human being to treat as well as a lesion; but in these cases the lesion is so grave that it both overshadows the rest of the patient's being, and also greatly modifies it, so that conditions ordinarily undesirable are now most acceptable.

One surgeon may say, "I have a number of hospital cases; I cannot allow one case to occupy a bed for so long a time as this treatment demands; I must use some method that will put them on the road to recovery sooner and make room for others."

Another may say, "I have many out-patient cases. Their parents will not carry out such treatment with the intelligence and fidelity necessary to success. I must find some method that will cure them more or less well, in spite of carelessness, indifference, perhaps the meddling of their friends."

Both these gentlemen are perfectly right. They are working under great disadvantages. They must compromise; they must use

makeshift methods, and get the best results they can under the circumstances.

But one thing they *must not do.* They must not make tenement-house work and the methods suitable to it their standard. I am not writing this article with reference to tenement-house cases, but a very different class; those who will meet us later in society and be known as our cases; also those people of means who come from a distance. For such the best is none too good. They demand the best, and are willing to pay for it and to help us in any way they can to obtain it. To the treatment of such cases we cannot give too much time, trouble, or thought. A good result will well repay us.

TRACTION AND FIXATION IN POTT'S DISEASE.

By REGINALD H. SAYRE, M D.,
NEW YORK.

One of the fundamental principles in the treatment of all joint diseases is, so far as possible, to secure the absence of traumatism. In the spine, traumatism may be caused, first, by movements of the diseased parts; secondly, by the weight of those parts of the body, when erect, that are above the point of disease; thirdly, by jars when walking; and, lastly, by the reflex muscular spasm common to joint-disease wherever situated. This muscular spasm is an effort on the part of Nature to secure rest for the diseased joint, and when an apparatus, or the surgeon's hand, or any other means, secures this rest, this reflex muscular spasm disappears. The care shown in the gait of patients with Pott's disease, and the frequency with which they support the weight of the upper part of the body by resting their hands on the seat of the chair, etc., point most clearly to the necessity of relieving the diseased spine from the superincumbent weight, and protecting it as far as possible from concussion.

Pott recognized the necessity for preventing concussion and removing the weight of the upper part of the body, but the rest in bed that he advocated, though certainly very beneficial, gives but very imperfect rest to the diseased spine, as it does not prevent motion or abolish reflex muscular spasm.

The addition of a posterior splint of metal or other material, fastened into position by straps around the shoulders and an apron across the chest and belly, more or less completely prevents movement of the diseased joint, but is defective in not supplying traction to overcome the ever-present reflex muscular spasm. Another objection to this class of splints is that the trunk must be so tightly girdled, in order to give rest to the spine, that respiration is greatly impeded, and, in consequence, the nutrition of the patient suffers.

To my mind, pain is a symptom of irritation, and the relief of pain is a good index of the removal of the source of irritation. The means that gives the greatest freedom from pain most thoroughly removes the source of irritation and puts the patient in the best condition to recover.

In all joint-diseases, in my experience, traction is a great reliever of pain, and I consider it a mistake to disregard it in the treatment of Pott's disease. I frequently see children insist on keeping the straps of their jury-mast so tight that it is very difficult to prevent galling of the chin and occiput from constant pressure, and yet these children beg to have their straps fastened again when they have been loosened to bathe the head, the pain caused by these chafes being so much less than that caused by the irritation of the spine when the traction is diminished. I have seen these same children, later on, when the inflammation of the spine was less acute, ask to have the straps of the jury-mast loosened; and, still later on, ask to have them removed altogether, the necessity for employing traction having passed by.

A patient of mine, an adult of great intelligence, with lumbar Pott's disease, who was confined to his bed for eighteen months prior to the application of a plaster-of-Paris jacket, has often spoken to me of the relief afforded by stretching his spine. I have seen him drive over rough pavements in his jacket, without the least pain, at a time when he was obliged to use the utmost caution in movement in bed with his jacket off. Some of the jackets I have made for him have failed to give relief, as they did not lift up the thorax sufficiently to protect the diseased lumbar spine, though they were adequate to prevent motion. He says that he is not comfortable unless the trunk rests in the jacket, and the weight is thus transmitted to the pelvis without pressing on the diseased part of his spine. I cannot help thinking that the more effectually we remove the weight from the spine in all cases the more efficiently we have protected the patient.

It is because they act by lifting off the superincumbent weight more effectually than other means that I prefer jackets passing completely around the body, to posterior supports which act merely by preventing motion, and do not diminish concussion or lift off superincumbent weight unless they are provided with jury-masts. Those that are provided with the latter are almost invariably defective in

having no base of support on which the splint may rest, and are prevented from slipping down, when traction is made on the head, simply by the friction of the splint on the body. This friction is distributed both above and below the point of disease, and thus adds to the pressure made on the diseased point, which becomes greater in proportion to the extent to which the straps of the jury-mast are tightened. In a badly-fitting plaster-of-Paris jacket the same trouble appears, and I have seen numbers of plaster jackets the jury-masts of which were fitted with pads under the joint where the crossbar was riveted—with the purpose, I suppose, of preventing injury to the head when the jury-mast rested on the child's crown. It is obvious that a child carrying a jacket of this kind receives no benefit from traction, but simply carries around on its inflamed spine the weight of the jacket and jury-mast in addition to the weight of that part of its body that lies above the point of disease.

In upper dorsal disease the point of inflammation is too high for the jacket to exercise sufficient control over movement, and for this reason I think that jackets are inferior to posterior metal supports fitted to pelvic belts that have bands passing above the crests of the ilia to form a base of support so that traction by a jury-mast may be effective. In addition to this, there should be curved metal bars passing from a plate that rests against the scapulæ under the axillæ to the front of the shoulder, where padded metal plates should make pressure, in order to prevent the shoulders from dropping forward, and thus causing the chest to sink in.

Straps passing around the shoulders are not effective, and the point of pressure in front must be the head of the humerus.

In cervical disease, also, if there be no time to have a suitable metal one made, the jacket is useful merely as a base of support for the jury-mast.

In lower dorsal and lumbar disease, however, for the reasons that I have mentioned, I think that jackets enveloping the body are more effective in giving rest to the inflamed area than posterior supports, as the latter exercise no upward traction, but simply bend the body backward, making a fulcrum of the posterior part of the spine opposite the point of disease, which they endeavor to separate, in the same way as a hinge is opened.

The more accurately a jacket fits, the better, and hence I prefer

those made on the patient to those made over moulds made from the patient's jacket, as the second one is not so sharp in outline as the first, and, in small, skinny children it is often very difficult to get accuracy of fit, especially when there is great deformity. Very little changes make the difference in having a jacket that will not slip over the hips, and one that will so slide when the jury-mast is tight. For making the original jacket on the patient, I have found nothing so satisfactory as plaster-of-Paris.

In closing, I would say that if, because of sores or because the pelvis is too small to afford a base of support, the case is not suitable to be treated in a jacket, I believe traction in bed by head-straps and weight and pulley, or by elastic, or, better still, by means of the portable wire cuirass, should be used; and in all cases of paraplegia in Pott's disease I would make faithful trial of traction and counter-irritation before proceeding to resection of the laminæ.

In making traction I should be guided by the feelings of the patient. To use my father's words when he introduced plaster-of-Paris jackets seventeen years ago: "Raise the patient until he is comfortable; there stop, and keep him so."

THE COMPARATIVE VALUE OF THE DIFFERENT METHODS OF TREATMENT OF CARIES OF THE SPINE.

By E. H. BRADFORD, M.D.,
BOSTON.

An opinion as to the value of the methods of treatment of Potts' disease must be based upon facts collected with as much care as possible.

Statistics as to the ultimate results in Pott's disease are obtained with great difficulty, as the disease runs a course of years; and at present it cannot be said that we have statistics of sufficient value to be of great assistance. The teaching of others may serve as guide-posts in directing the course of our opinion; but, after all, no surgeon can be simply a follower.

The opinions here presented will, therefore be based upon personal experience. They are presented as a contribution to this discussion, with every appreciation that they may contain errors and fallacies which are too often included in personal opinions.

The methods of treatment now in use are as follows: 1. Treatment by recumbency. 2. Treatment by portative mechanical appliances. 3. Treatment by means of plaster jackets.

It being granted that these methods are of value, the question becomes simply, What are the limitations of these methods, and in what cases can they be used with benefit, and in what cases are they to be avoided?

This question, as will be readily seen, is not one that can be precisely answered; and for this reason the different methods will be discussed as to their special value.

I think it will be agreed to by all that the principles of treatment involved in the different methods are the same; namely, the diminu-

tion of pressure on the affected carious bodies. Whether recumbency is used, whether plaster-of-Paris jackets, or whether what is termed antero-posterior supports are applied, in all cases the attempt is made in treatment to prevent the superincumbent weight from pressing the spine in such a way as to crowd the bodies together.

It may be added that, for the purpose of confining the discussion to its prescribed limits, no mention will be made in this paper of the complications, abscess and paralysis.

Treatment by Recumbency.—The advantages of the treatment by recumbency are readily stated. The patient is put at rest, is prevented from falling, and the superincumbent weight is removed from the spine. It must, however, be understood that these advantages from recumbency are not obtained by simply placing the patient in bed and allowing him complete freedom to sit or twist in bed. The patient should be secured to a proper retention frame, on which the patient can lie with comfort, and be moved about so as to be given the benefit of a change of air; the bed must be prevented from sagging, and a pad must be placed underneath the projecting portion of the spinal column. In the most sensitive cases it will be found that some form of fixation will be necessary besides the frame, and I have used both a plaster jacket, a plaster posterior support, and a Taylor brace. The drawbacks of the treatment by recumbency are also manifest. The patient is necessarily confined, and the reparative processes may be thereby hindered.

As caged animals are found to be liable to tubercular affections, so it is natural to assume that children completely deprived of liberty, and confined will be unable to recover as rapidly as is desirable from a tubercular process. After a while the patient becomes pale, the appetite fails, the digestive functions are enfeebled, and the patient becomes apathetic. Under these circumstances the recumbency is not desirable. It manifestly cannot be carried out for any great length of time—that is to say, during the whole process necessary for the cure and complete ankylosis of the spinal column, that is, two or three years—but it will be found of great assistance during the acute or painful stage. In fact, thorough treatment is impossible at this stage without recumbency for a while at least. In suitable cases, when patients are first placed under this treatment, the irritability,

the nervous excitability, and the pain gradually subside. This is not the case immediately in some instances, but after a few days the children submit themselves to confinement, and there is a manifest improvement in their general condition. The difficulty caused by constipation is checked by an enema, and the patients will be found to eat better than formerly, to be free from pain, and to be in excellent condition. After the treatment, however, has been prolonged too far they become anæmic, the muscles are less active, and the children more listless; and, although they may be sufficiently well nourished, they resemble a patient in the condition of nervous prostration, in the stages of convalescence—that is to say, with their nervous force comparatively weakened, and not yet up to a normal condition. Under these circumstances the treatment by recumbency is to be discontinued. In short, it may be said that this stage of treatment is only to endure so long as the evidences of the acute condition are present.

Recumbency is, it has seemed to me, the most thorough way of prevention of any increase of the projection. Dr. Taylor has reported recession of the curve under portative mechanical treatment; yet this is not to be expected except in low dorsal and lumbar cases, and only after the greatest care in treatment and in nursing. Under ordinary circumstances recumbency seems to me a more certain mechanical method for promoting recession; but it is evident that it can only have that result if carried out carefully and according to mechanical principles.

The exact value of traction in addition to the recumbent treatment in caries of the spine is not easily determined. The treatment is an old one, and when used will be found to be beneficial; but whether it acts as a means of fixation simply, or as direct counteraction to the muscular spasm, has not yet been proved. The prevention of intervertebral pressure can be obtained by placing pads under the projecting deformity, making that portion the higher portion of the couch, on which the patient can rest. In this way the spine is straightened as much as is possible. It is manifest that traction in certain regions may be injurious; for in the lumbar region when lordosis is marked, traction will have the same effect as in suspension, correcting the antero-posterior convexity, which it is desirable to preserve.

In the cervical region the beneficial effect of traction is unquestioned. It is undoubtedly an efficient aid in fixation.

In brief, the indications for recumbency are pain and a disinclination or disability on the part of the patient to walk or run freely or readily. The limit is in an evidence of imperfect assimilation, unless manifestly due to suppuration or to amyloid or extensive tubercular process.

The question of ambulatory treatment is an important one, and, in so chronic an affection as Pott's disease, some form of appliance is necessary to establish a permanent cure, as recumbency is not advisable during the subacute or convalescent stage. But it must be fairly conceded that it is impossible by portative appliances to thoroughly remove the superincumbent weight; and for this reason, in the more acute stages ambulatory treatment should not be relied on. But anyone familiar with the disease is aware that the acute stage may never be present in a case, and is usually only temporary. The advantages of ambulatory treatment are so great that they must be relied on chiefly in the management of cases of this disease—if not throughout the whole course of the affection, certainly during a large part of it. As to the form, it will be readily admitted that perfection has not been yet reached; and it will also be granted that the improvement in the last generation has been so great that what was not possible in ambulatory treatment forty years ago is now not only possible but advisable.

Of the different forms of portable appliances, the writer unhesitatingly prefers the Taylor antero-posterior support, indicated in the Transactions of the Orthopedic Association, Vol. II. This constitutes the brace, which seems the most efficient and thorough, modified of course, according to the situation of the disease in the different parts of the spinal column.

The uprights should be long and come high in the neck, reaching as high as possible, and the long part of the appliance should reach as far down as possible. I myself use the upright made of a single piece, instead of in sections as used by Dr. Taylor. This seems to me to be simpler. In regard to the use of pads, I agree with Dr. Taylor that in the majority of cases a hard pad is better than a soft one, but in some instances I have been obliged to use a softer one. It is my practice to have the pad plate covered with leather, rather

than with hard rubber, owing to the difficulty in obtaining good hard-rubber work. Where pads are used I make use of saddlers' felt. The front piece as used by Dr. Taylor I found very efficient, and there is nothing to be added to his description of the use of an apron.

Simple plaster-of-Paris back supports, described by Dr. Sayre as "turtle shell," and mentioned by Dr. C. F. Taylor, who preferred silicate of potash, which was adjusted to a cast taken from a patient's back when recumbent, mentioned by Lorenz in Berlin, have not seemed to me to furnish as efficient antero-posterior support as can be given in other ways; and it is for this reason that I prefer an ordinary plaster jacket in cases where cheapness is the chief consideration. Where head supports are needed the jury-mast is certainly a most efficient one. It is, however, extremely unsightly, and parents are anxious to lay it aside as soon as possible. It needs care and watching to prevent the loosening of the straps, and is of no value when the patient is recumbent. For this reason I have not employed it as much as other forms. As a choice between the excellent circular Taylor ring chin-support, or the wire chin-support, resting on the shoulders in front and connected to a back brace behind, perfected by Dr. Goldthwait, of Boston, I have found an advantage in the wire support in cases where the patients are inclined to run the chin forward, and in upper dorsal rather than cervical cases. Of the Thomas collar, it may be said that in cases of cervical caries it is an advantage, but in cases of the upper dorsal it does not answer as well, and it is an inefficient antero-posterior support.

In all forms of head apparatus it will be found, according to my experience, impossible to obtain a perfect support at all times. For the patient is able to alter the physiological curve of the neck, except in case of higher cervical caries, and in that way rise above the support. It is for this reason that it seems to me that all head supports, even the jury-mast, act more on the principle of a rest or support, similar to that used by placing the hand, than on the principle of traction. The patient seems to be able, no matter how tightly the apparatus is applied, at times to raise the chin above the support. Of the Webster chin-support, I can simply state that in the experience of the inventor it was the most comfortable thing that

could be worn; but it does not seem to me a readily made appliance, and would give the surgeon much trouble.

Plaster Jacket.—In spite of all the criticisms that have been brought against the plaster jacket, its use in a large number of cases and its efficiency in the pauper class cannot be denied, and in certain respects it presents the most ready and valuable means of treatment which have yet been devised. The wave of enthusiastic reception which first greeted its introduction has subsided, as well as the period of criticism and recoil from the claims of too enthusiastic advocates, and to-day it must be accepted as one of the readiest of the practical treatments.

The objections may be classed as follows: That they are uncleanly; that they are clumsy; that chafing or ulceration may form underneath them, and one is unable to treat them; that in certain cases they cause great discomfort; that they may be improperly applied. All these criticisms can readily be disposed of. Like every other remedy, they are to be used only in suitable instances by persons who are trained to the application. For I think it will be readily admitted by all who have had experience in the matter that the application of a plaster jacket is not an altogether easy matter, and requires a great attention to detail and a great deal of care. It was originally supposed that the plaster jacket was a means of distraction of the vertebral bodies, but this, I am confident, is in no sense the case. The proofs of this assertion will be based upon experiments upon cadavers, on the clinical results from plaster jackets, and upon the evidence of pressure, which is given by jackets when thoroughly and successfully worn. The experiments on cadavers show that the amount of force that is necessary to pull the vertebræ apart is much greater than it is possible to conceive exists in a plaster jacket.

I have used plaster jackets in cervical caries, applying them above the shoulder, and also quite low in the lower dorso-lumbar region. In this region, however, in some cases I have found that suspension is unadvisable when a patient assumes by preference, to relieve the pressure on the vertebræ, a position of lordosis. Suspension destroys this, and a jacket holding them in a corrected position is more uncomfortable than a jacket applied to the patient leaning backward. Split plaster-of-Paris jackets, leather jackets, and sili-

cate can be used in the later stages; and cloth corsets, stiffened by steel strips, can also be used; but in practice I have not relied upon the latter largely, even in the stages of late convalescence, preferring leather corsets. In some instances of lower dorsal caries I have found the use of ordinary crutches, in addition to corsets, an appliance of value, and in certain cases suspension wheel frames may be of use; but I have rarely found the latter necessary.

The conclusions which I have been led to adopt may be stated as follows: That Pott's disease represents one of the most curable of surgical affections; that its treatment involves care for a long period, three or four years, and that treatment short of that is treatment of only a stage.

During the painful stage, recumbency with complete fixation is the best treatment.

In the stage of improvement the benefit of air and exercise is essential, and efficient support is necessary. In this stage the antero-posterior steel support is efficient and reliable, if carefully fitted and well applied, and will enable the surgeon to obtain excellent results.

The plaster jacket furnishes a ready and efficient means, applicable where special skill is not possible and where nursing is imperfect.

GENERAL DISCUSSION ON POTT'S DISEASE.

Dr. Ketch was quite sure that all would have better results in the superior and inferior regions of the spine by any apparatus giving fixation, than in the middle portion of the spine. In the dorsal region one has constantly to combat the movements of respiration; and, in addition to this, the vertebræ are so movable above and below that there is no good fixed basis of support for our apparatus. In listening to the papers already presented he had been reminded of three cases in the cervical area in which sudden death occurred with symptoms leading him to believe that there was direct interference with the centres of respiration. There was difficult respiration, without elevation of temperature, and without marked changes in the pulse. No post-mortem section could be obtained. They all occurred among children wearing the antero-

posterior support with a chin-piece. In cervical disease it is well to remember that one occasionally meets with sudden and inexplicable deaths. About the time of the first general use of the plaster-of-Paris jacket he employed it in many cases of upper dorsal and cervical disease, and he was very much disappointed with it as a fixative apparatus when used with the jury-mast. The chin-piece of the Taylor apparatus was a much more efficient support in cases of upper dorsal and cervical disease. It seemed to him that above the seventh dorsal vertebra sufficient support could not be derived from the plaster-of-Paris jacket, so that its action must be supplemented by some other lever. In the lumbar region, with perhaps the exception of the last lumbar, almost any apparatus which will give fixation will yield a very good result. In his experience, the portions of the spine in which the least deformity occurs is in the cervical and lumbar regions.

Dr. George W. Ryan, of Cincinnati, said that to his mind the ideal treatment of Pott's disease was recumbency, but this method could not often be carried out in private practice, although good results are often obtained by simply insisting that the child shall remain in bed, but without any further restriction upon its movements. With good hygienic surroundings he did not believe that recumbency ever caused the general health of these patients to deteriorate; but, on the contrary, he was positive that many were distinctly stronger for it. The question of traction and fixation is one of much interest; but he was not at all sure that the attempts at traction really caused any separation of the vertebra, and this opinion, he was sure, represented the general sentiment of the profession at large. He had found the split plaster jackets very efficient after the acute stage, and with a careful mother they were very much more cleanly and durable. Mechanical treatment is often kept up long after the disease has ceased to be active, but he doubted if this practice were advisable.

Dr. John Ridlon, of New York, said that some years ago he read a paper upon this subject, and it was severely criticised. He had had patients in bed for from three to four years with Pott's disease and other tubercular affections, and he had never seen a

single case which was not decidedly improved by recumbency. These patients certainly did very much better than when allowed to go around while still suffering pain.

Dr. R. H. Sayre said that the principle of Dr. Bartow's jacket, which allowed great compression of the thorax, the speaker thought was inferior to that which made the edges of the corset come together and secured them in position. When the edges of the jacket overlapped, the sense of compresssion of the thorax was similar to that produced by the apron of the Taylor brace.

The cases of Pott's disease in adults were not so very rare; he had seen a number of them, but thought in old age it was much less common. He remembered seeing but one over fifty-five years of age. This man had paraplegia and abscesses, but recovered from both, and was able to resume work as a stonecutter. He subsequently died of an affection of the lungs. Of course these cases in old people may perhaps be syphilitic. In this case no examination was made of the discharge of the lungs for bacilli, though the general appearance of the case, and the fact that he recovered without anti-syphilitic treatment, would be strong evidence in favor of the process being tubercular and not syphilitic.

In regard to Dr. Weigel's case he would suggest that the jacket may be better applied in the recumbent position in patients who are in such a weak condition.

If we can reason by analogy, we should not expect the inflamed joints in Pott's disease to be abnormally movable, as stated by Dr. Foster. In other joint inflammations we find the joint much less movable than normal, except in those cases where there is a large effusion present. He would heartily endorse the advocacy of recumbency in many cases, but would urge most strongly the advantage to be derived from using the wire cuirass and jury-mast, so that the patient may have the benefit of rest, and at the same time of fresh air and sunshine, which, in many cases, are of the utmost importance.

Mr. William Adams, of London, in a communication to the Secretary, after regretting his inability to attend the International Congress meeting in Washington, and his inability, on account of

ill-health, to write any paper to be read at the Orthopedic Section on "Pott's Disease of the Spine," wrote:

"I am the more sorry, as I see you have an interesting discussion on 'Pott's disease of the spine.' When I wrote the article for Quain's *Dictionary* some years ago I took pains to describe the diagnostic symptoms of the early stage—*i. e.*, before angular curvature is formed—in the cervical, dorsal, and lumbar regions. I am not sure whether, in the first edition, I alluded to the plan of extension by the head in the recumbent position when the disease is in the cervical or upper dorsal region. This treatment I have successfully employed in several cases. I always keep the patient on a movable plane, which can be put into a spinal carriage, so that the child can be taken out daily for fresh air; extension being kept up all the time by means of a headgear regulated by rack-and-pinion movement. I have used it in many cases where the patients have been brought to me with recent paralysis, and the rapidity with which this is removed by extension with recumbency has surprised me. In two or three days the improvement commences and steadily increases, so that in a few weeks sensation and motion are partially restored, and later on completely cured. . . . . I think I mentioned these cases in the revised article for the second edition of Quain's *Dictionary*, which will soon appear."

A FURTHER CONTRIBUTION TO TYPHOID SPINE.

By V. P. GIBNEY, M.D.,
NEW YORK.

While driving about Salzberg, in the Austrian Tyrol, in the latter part of August, 1890, I observed that my cabman held his head rather awkwardly, and, on closer inspection, noticed a distinct prominence in the cervico-dorsal region. My interest was naturally awakened, and I learned that the man, Hans S., aged forty-five, when twenty-two years of age had what his physician called typhoid fever. He was quite sick for four weeks, at the end of which time convalescence set in, and after a few days he experienced great pain in the forehead and top of his head, gradually extending toward the back of the neck. His sufferings, he remembers, were very acute. The parts around the neck became very tender, there was a little swelling over the cervical vertebræ, he had brachial and occipital neuralgia. After a few weeks these pains subsided, but left him with a certain amount of deformity which has persisted. He never had any abscess. It was nearly two years, however, before he regarded himself perfectly well and able to work. The torticollis (for such it is) has remained; the lateral masses are very much thickened; he is able to work all day without special fatigue. He was one of nine children, and during his early childhood was regarded as the sickly one of the family.

I present the notes of this case briefly, as a contribution to the subject. Two years ago I presented a paper to this Association. In none of my cases at that time reported was there any marked deformity left over. One of the cases I reported, that of a young lady whose hip and lower part of the spine seemed to be affected, I thought at that time would make a complete recovery; but only recently have I seen her, and she still had a little halt or defect in

her gait. No one of the cases where the lesion was confined to the vertebræ has remained in any way deformed, except the one just reported. Of course, the history may be imperfect, yet the account given was very clear. My friend, Dr. Frank Watson, of Boston, was with me at the time, and I had the advantage of his thorough knowledge of the German language, so that the facts as given were corroborated by the Doctor. One can readily see how a periostitis in this locality might extend from one transverse process to another, and how a certain amount of bony deformity could result, depending altogether upon the activity of the process. It might depend further upon the constitution or physical condition of the patient. It so happens that in my former cases the patients belonged to the better class, had been better nourished, and their physical condition was altogether above that of the ordinary hospital or charity case.

DISCUSSION.

Dr. N. M. Shaffer, of New York, said that when the author had presented his first paper on this subject he had reported a case which had been attributed to an attack of typhoid fever, and in which, after death from an accident, the post-mortem examination showed periostitis and degeneration of the cord. He had quite recently learned that he had been misinformed, and he now begged to state there had been no typhoid fever in the case.

Dr. Samuel Ketch, of New York, asked whether, during the course of a typhoid fever, any of the members had had occasion to examine the condition of the psoas muscle?

Dr. Gibney said that in most of the cases he had seen the symptoms did not develop until one or two months after the typhoid fever.

Dr. B. E. Hadra, of Galveston, recollected an epidemic of typhoid fever characterized by such marked tenderness on pressure over the vertebræ that at the beginning of the epidemic some of the physicians were inclined to consider the disease one of meningitis.

Dr. R. H. Sayre, of New York, thought that as arthritis occurred in various joints during typhoid fever, it should not be a matter of surprise that spinal arthritis sometimes developed. If he remembered correctly, the cases reported by the author in his first paper differed from these later ones, in that they were of quite short duration. He looked upon typhoid fever simply as a starting-point of a periostitis or ostitis in these cases.

ON ELONGATION OF THE LIGAMENTUM PATELLÆ AS A FACTOR IN THE PRODUCTION OF CERTAIN KNEE TROUBLES AND DIFFICULTIES OF LOCOMOTION.

By NEWTON M. SHAFFER, M.D.,
NEW YORK.

In the year 1873, a man of about twenty-five years of age applied at the New York Orthopedic Dispensary, complaining of considerable difficulty of locomotion, and especially of great difficulty when going up and down stairs. The patient was supposed, by the physician who referred the patient to the Dispensary, to have an insidious form of paralysis.

Various tests and a careful examination proved that there was no paralysis present. The patient then said his knees were very weak, and an examination of these joints showed a very peculiar state of affairs. The patellæ, when the patient was in a sitting position with the knees flexed just beyond 90°, were drawn above the condyles of the femur, and were lying in a plane almost horizontal with the long axis of the femur. The ligamentum patellæ on either side measured three and a half inches long and the altered joint outline was characteristic of these peculiar conditions. The patient stated that he had to walk very carefully, or he would, upon the slightest lateral jar, dislocate one of his knee-caps outward, and fall suddenly to the ground. There was a slight knock-knee on either side, and there was present at the intercondyloid notch a very perceptible tumor—an apparent exostosis—which occupied the position at which the patella would normally rest.

Several attempts were made to relieve the condition by the use of apparatus. He finally obtained some comfort and a little relief by using a silk elastic knee-cap with a lateral pad crescentic in shape,

and made of rubber, which prevented the outward dislocation of the patella. The patient was lost sight of. He knew no cause for his trouble.

This case made an impression upon me, and a photograph was taken at the time, but it has become lost or mislaid in the years that have elapsed. It was not until a later period, when an opportunity occurred to watch the progress of a similar condition, that this case became of value.

In 1884, I was called by Dr. Janvrin to see a young lad of fourteen years who had hip-joint disease. The usual traction apparatus was applied, and, at the end of two years, the hip trouble was entirely removed. About this time, however, the patient began to grow very rapidly and to show signs of a progressive knock-knee. The member (right) affected with hip-joint disease was quite straight, but the opposite side showed a very considerable genu valgum.

An examination of the ligamentum patellæ showed that it was three and one-fourth inches long on the left side; on the opposite side it was three inches long. The evident upward displacement of the patellæ on either side was marked during flexion of the knee at right angles. There was a distinct tumor in the intercondyloid notch on either side, more marked on the left; and the patient moved up and down stairs with an awkward gait and fell at times without apparent cause. During his first summer in the country, after the hip disease was cured, he fell and dislocated his right patella. This was reduced by the family physician. The following year, he dislocated the left patella. In each instance, the fall occurred while the patient was walking on an irregular surface.

The dislocation of the left patella proved a serious affair. The surgeon in attendance failed to reduce it, and, when the patient returned to the city, all attempts to reduce it seemed useless. When replaced, the bone immediately slipped back into its old position. At a consultation, at which the late Dr. H. B. Sands, Dr. Janvrin, and myself were present, it was decided to make no further attempt at reduction, for the reason that the intercondyloid tumor and the elongated ligamentum patellæ would prevent the patella from moving in its true longitudinal plane. For the same reason, it was decided not to perform Macewen's operation, though the knock-knee

was very considerable. Dr. Sands considered these reasons to be of sufficient importance to contra-indicate surgical interference.

With the use of my knock-knee apparatus, the genu valgum was much reduced, and the patient now has a slight knock-knee, a dislocated patella on the left side, and a very serviceable knee on the right side. His left ligamentum patellæ is still three and one-fourth inches long; his right, three inches long. He can place his left knee in full extension, with the quadriceps extensor femoris acting upon the dislocated patella, which moves back and forth above, and to the outside of the outer condyle of the femur. When sitting with knee flexed, patient abducts and rotates thigh outward to secure the quadriceps action upon the patella. He flexes the knee by a semi-rotating movement. The tibia is rotated permanently outward, so that the tubercle of the tibia is fully one inch to the outside of its normal position. Even if the patella was in its normal position its line of movement, taking the insertion of the ligamentum patellæ as a guide, would be directly through the outer condyle.

By careful treatment, and especially by avoiding traumatism, and by the use of a firm conventional leg-brace, which gives lateral support and prevents the rotating movement of the tibia upon the femur, the patient now walks from ten to fifteen miles a day.

I next saw a lady, Mrs. E., aged about thirty-five years. She came to me, unable to walk, except with great difficulty, and always with danger of falling. The least irregularity of the pavement would cause a fall. She had never dislocated her patellæ. There was slight knock-knee on either side. The ligamentum patellæ on either side measured three inches, and the patellæ occupied the position indicated in the accompanying photographs of Maggie M. This patient had great difficulty in going up or down stairs, and the disability was almost identical with that produced by a transverse fracture of the patella, with a long ligamentous union. Light lateral "leg-braces," preventing lateral movement at the knee and arresting the rotating movement of the tibia during flexion, gave this lady almost complete relief. She could walk with great comfort, and without any fear of falling.

The following history (condensed) is taken from the books of the New York Orthopedic Dispensary and Hospital:

Maggie M., aged thirteen years. Admitted December 2, 1886.

Two years ago fell on an orange-peel. Up to that time seemed all right. Since then falls easily and frequently. When she first fell,

Fig. 1.

she dislocated her left knee-cap, which was reduced by a woman who saw the child fall. Right patella dislocated about two months ago by a similar accident. After each fall, the knee swelled, and

Fig. 2.

there was some pain, which gradually disappeared. Previous treatment, "knee-cap," which did no good. Both limbs measure the same in length and circumference, being about normal.

No knock-knee; very slight lateral mobility at knee-joint. Patellæ when knees are at rest in full extension lie above condyles and look obliquely upward and outward. Patellæ freely movable, and, when relieved of muscular action, they can easily be brought down to normal position. Disability in walking, etc., exactly like that produced by fracture of the patella with long ligamentous union. There is an evident exostosis at sulcus between condyles of femur. Length of left ligamentum patellæ two and three-fourths inches; right, two and five-eighths. The exact condition and relation of the parts is shown in the accompanying photographs, the tubercle of the tibia and the patella on either side being outlined by ink before the photograph was taken.

The treatment consisted in the use of leg-braces limiting the lateral and rotating movements of the knee. The patient obtained some relief, but was lost sight of after a few months.

In the case of Miss X., whose knees had been for a long time immobilized in plaster-of-Paris dressings, with a consequent fibrous ankylosis, the patellar ligament was stretched by the force required to break up the sub-patellar adhesions. The right ligamentum patellæ is now two and three-fourths inches long; the left, two and a half inches long. An expressive disability exists in this case, occasioned partly by the reduced quadriceps power in knee use, and partly by a disagreeable "click," which occurs when the patella, especially on the right side, slides into its supra-condyloid position.

Several cases of elongated ligamentum patellæ have come under my observation since. I will briefly relate two:

A young man, Mr. W., consulted me because he had great difficulty in keeping up his part in playing lawn tennis. His knees, as he expressed it, "gave out very quickly." His patellar ligaments were nearly three inches long, and the disability was easily explained. He had considerable pain after prolonged use of his knees. Heat and swelling were sometimes present. He wore knee-caps without relief. He declined to submit to an operation which had for its object a shortening of the elongated ligament. He would not wear apparatus, and so long as he does not use his knees too much, he is

now comparatively comfortable, though he has occasional attacks of pain and swelling after over-exertion.

A lady, Mrs. V., well and strong, quite muscular, and, as she says, "never sick," found difficulty in going up or down stairs. In this case, the elongation of the patellar ligaments was very marked. The cause being explained and the remedies proposed being rejected, nothing was done, though the patient's trouble seems to be increasing rather than otherwise.

I might relate other interesting cases where there was knee trouble due to the lengthened anterior patellar ligament. In some of them there was heat, pain, and swelling, due to overstrain, but no true joint inflammation. In others, a sense of weakness and debility. In others, tendency to dislocation of the patella outward. In all, however, there was a greater or lesser degree of disability under severe, or in some cases, ordinary use of the joint. It was especially noted when much strain was brought upon the articulation in the flexed position.

I have not succeeded in persuading any of my patients to have a section of the ligament removed. The operation seems both feasible and justifiable. Dr. Sands, in the case reported, declined, as before stated, to perform this operation, principally because of the apparent exostosis at the point where the patella glides between the condyles. This exostosis has existed in almost all my cases, and its cause is very obscure. It would seem to be a hypertrophy due to the lack of the normal pressure of the patella, which in its acquired position does not rest in the intercondyloid space.

I have measured many normal anterior ligaments of the knee since these cases came under my observation. Its normal length varies from about one-half inch in children to two inches in adult life. These measurements were made from the apex of the tubercle of the tibia to the lower edge of the patella, with the quadriceps in full contraction, with the knee bent at 90°, thus making the ligament taut. In some adults, the ligament is only a little over one inch long; in others it is about one and a half; and in a few tall persons, it is about two inches long when measured as above. Anatomists vary very much as to the length of this structure. For example, Gray gives it as three inches; Ellis, as two inches; Morris, as two and a half inches on its inner border, three and a half on its outer

border. But these measurements represent the ligament deprived of all contiguous tissue, and are made upon the cadaver. The ligament extends, for example, below the apex of the tubercle. Clinically, the measurements made by myself are correct, both as applied to the normal and elongated patellar ligament—the points of measurement being the same in either case.

Shortening of the ligamentum patellæ is also a condition that I have seen quite often. It has generally occurred as the result of a disused or paralyzed quadriceps extensor femoris muscle. In some cases, where the anterior thigh muscles are paralyzed, as in poliomyelitis anterior, the patella will rest against the tibia, and no trace of the ligament can be felt. The same may be said of certain cases of ankylosis of the knee, where the patella has been late in attaching itself to the subjacent bone. The ligament shortens under the influence of gravity and disuse, following a diseased or paralyzed quadriceps, and it becomes very short after a time.

My experience proves that this condition of elongated ligamentum patellæ is neither rare nor unique. As to its cause, I can find no satisfactory clue, except, of course, in cases like Miss X.'s, where force was used to dislodge the adherent patellæ. It is altogether likely that, in most cases, the condition is either congenital, or acquired early in life; and the fact that the majority of my cases were women or children, the former being ladies of leisure and refinement, without the history of an injury, would seem to eliminate traumatism as a cause.

A peculiar feature of these interesting cases is the intercondyloid growth, which in Dr. Janvrin's case gradually assumed the character of a considerable osseous tumor. As a mechanical factor, it prevents the normal movement of the patella over the trochlea, and it is a persistent barrier to a perfect restoration of the parts. In Dr. Janvrin's case, three separate operative procedures were indicated to restore the parts to anything like a normal relation. 1st. Macewen's supracondyloid operation to remove the knock-knee. 2dly. To shorten the ligamentum patellæ. 3dly. To remove the intercondyloid tumor. The result of the conservative treatment advised by Dr. Sands would seem to sustain his position that this complex operation was uncalled for.

My conclusions may be briefly stated:

1st. Elongation of the ligamentum patellæ may produce weak, painful, and apparently inflamed knee-joints.

2d. Many obscure knee-joint troubles, as well as impaired or difficult locomotion may be explained by this condition.

3d. Elongation of the ligamentum patellæ may produce a disability very like that produced by an elongated ligamentous union after transverse fracture of the patella.

And finally, elongation of the ligamentum patellæ may be, and very frequently is, produced by forcibly breaking up a fibrous ankylosis of the knee-joint.

DISCUSSION.

Dr. Albert Hoffa, of Würzburg, asked whether the patient with elongated ligamentum patellæ was able to make *voluntary* dislocation of the patella.

Dr. Shaffer, replying in the negative, said that none of them knew they had any knee-joint trouble except pain and disability. In some cases there was heat and swelling, but no true joint lesion.

Dr. Samuel Ketch remarked that he believed Dr. W. R. Townsend had presented on a previous occasion a case having the power of voluntarily dislocating the patella. He had had an opportunity of observing the cases reported by Dr. Shaffer, and judging from the literature, they were unique. This, however, was probably due to the fact that attention was not often called particularly to this point. Elongation of the patellar tendon would account satisfactorily for many functional disturbances of the knee-joint, especially those occurring in locomotion, where no inflammatory lesion could be discovered.

Dr. Ap Morgan Vance, of Louisville, said that he had not seen any cases like those described in the paper, but he had noticed in old, neglected cases of knee-joint disease, with flail joints, that the ligamentum patellæ often became much elongated, and in cases of supra-condyloid osteotomy, after the position had been corrected

that not only the relaxation of the patellar ligament, but of the other ligaments, was much diminished, thus adding to the stability of the limb. This point had been mentioned at last year's meeting by Dr. H. L. Taylor. He was of the opinion that the ligament might become shorter if not constantly stretched by use.

Dr. V. P. Gibney wished to report a case in which, after a period of one and a half years, no such shortening had occurred. This, however, he considered exceptional.

Two or three years ago, a girl came under treatment for what seemed to be simple knock-knee from relaxation of the ligaments. She was treated mechanically for a number of months without benefit, and finally, after performing a supra-condyloid osteotomy, the parts were kept up in plaster-of-Paris for about six weeks. On romoving the plaster, bony union seemed to be good, but owing to the laxity of the ligaments, an apparatus was kept on for three months longer, and she was then sent home with what is called a Thomas knock-knee spring. She returned after a few months, worse than before.

She was again put up in plaster for awhile, and for the past four months he had been injecting alcohol hypodermatically on either side of the knee under the patella, hoping in this way to excite a subacute inflammation which would result in a shortening of the ligament.

Dr. R. H. Sayre thought more benefit was obtained in these cases of general relaxation of the ligaments of the knee-joint by douching and vigorous but scientific massage applied to the joint and to the whole limb than by any other means he had tried. He had seen very favorable results obtained by these means in quite severe cases.

Dr. Shaffer, in closing the discussion, said that one of the principal points in treatment, and one which would insure the patient's comfort, was to prevent the rotation outward of the ulna upon the femur during flexion, and to prevent any lateral movement due to relaxation of the crucial ligaments, and to convert the knee-joint into a true hinge joint. By this he meant the prevention of lateral motion, and the rotation of the tibia on a vertical axis.

OBSERVATIONS ON TORTICOLLIS, WITH PARTICULAR REFERENCE TO THE SIGNIFICANCE OF THE SO-CALLED HÆMATOMA OF THE STERNO-MASTOID MUSCLE.

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Assuming that the treatment of any affection must to a great extent depend upon our apprehension of the causes that produce it, I shall call your attention more particularly to etiology, the conclusions being influenced by clinical investigation rather than by recorded theories.

That the bearing of these conclusions on the question indicated by the title of this paper may be clearly understood, I quote from several of the more prominent writers on the subject. F. Busch,[1] for example, says : "Congenital wry-neck is caused, as Stromeyer was the first to show and as is now acknowledged, almost without exception by injury to the sterno-cleido-mastoid muscle at birth, and by subsequent shortening at the place of injury by scar-contraction. The deformity occurs almost exclusively in children delivered by forceps, or more frequently in breech or foot presentations."

In the *Deutsche Chirurgie*[2] the subject is treated by Fischer as follows: "It is certain that tearing of muscle at birth, as Stromeyer has shown, is a frequent cause of torticollis. A tumor appears at the seat of the injury a few weeks after birth, which slowly disappears, leaving shortening by scar-contraction."

Volkmann and Vollert[3] have resected and examined portions of muscle in cases of supposed congenital torticollis. In some no change was apparent; in others the muscular substance had entirely

[1] Von Ziemssen's Handb. der allg. Ther.
[2] Bd. xxxiv. S. 32.
[3] Centralbl. f. Chir., No. 14, 1885, No. 38, 1890.

disappeared, to be replaced by fibrous tissue; while in the remainder the fibrous degeneration was diffuse, as shown by bands in the muscle substance. These changes they regard as the result of myositis caused by injury at birth While these observations are of value as showing changes that may occur in persistent wry-neck, they can have but little bearing on the question under consideration, as no evidence is presented of original injury or of subsequent induration, and because similar changes are found in cases of acquired torticollis of long duration, as reported by Robert, Marchessaux, Bouvier, and Witzel.[1]

It is evident that the term injury is not used by these and other writers in a general sense, but applies to partial rupture of the sterno-mastoid muscle—caused, it would appear, by torsion[2] of the neck during delivery of the head, followed by effusion of blood,[3] and later by an encapsulating inflammation[4] at the seat of the injury, as shown by a hard, painless tumor in the substance of the muscle. This induration slowly disappears, to be replaced by fibrous tissue which, contracting, causes permanent torticollis—in other words, a purely mechanical shortening, as distinct from the nerve irritation and spasm that we usually associate with wry-neck. As to the first part of this proposition—that injury of muscle may occur during labor and that it is followed by induration at the seat of the rupture —there can be no doubt; but that such rupture is followed by scar-contraction and that it is the usual cause of congenital torticollis, is extremely improbable. A partial subcutaneous rupture of a normal muscle would seem to present every requisite for quick and perfect repair. Scar-contraction never follows similar injuries in later life, nor do we find in other situations anything analogous after injury at birth. If then, we are to accept this theory, it would seem that the supporting evidence should be very direct and conclusive, such as the recorded observations of a number of cases—from the original injury, with its succeeding induration and scar-contraction, to the persistent torticollis which is supposed to result. Such evidence,

[1] Deutsche Archiv f. Chir., 1882, p. 181.

[2] Küstner: Centralbl. f. Gyn., No. 9, 1886.

[3] Bouchut: Traité prat. de Mal. des Nouv.-nées, Paris, 1875.

[4] Skrzeczka: Vierteljahrsschrift f. gemein. u. offt. Med., 1869, S. 129. Hüttenbrenner: Lehrb. f. Kinderheilk., 1886.

however, is not contained in the literature of the subject, although the theory—originating fifty years ago with Stromeyer[1] and Dieffenbach—has been indorsed by nearly all subsequent writers,[2] gathering weight, it would appear, by reiteration rather than from actual investigation. It should be stated that this theory of the origin of congenital torticollis has been vigorously combated by Peterson[3] and flatly denied by Weiss,[4] as follows: "Ruptures of the sterno-mastoid muscles are frequent enough during labor, but they are never followed by torticollis, and it is impossible to accept the theory advanced by Stromeyer and Dieffenbach."

It is apparent that we may obtain reliable evidence on this question from two sources: cases of induration followed to their termination, and cases of supposed congenital torticollis traced back to injury and subsequent induration, if such existed.

In the records of the Hospital for Ruptured and Crippled were found eighteen cases of so-called hæmatoma; nine could be traced, and of these two were excluded for mistaken diagnosis—the first because the after-history seemed to point to an inflamed gland as the cause of the induration; the second because the mother is positive that no tumor was present at any time. In both instances the torticollis, which was the prominent symptom, quickly and permanently disappeared. The history and results in the remaining cases are as follows:

Case I.—A male infant brought to the hospital on August 26, 1889, at the age of two months. Fifth child; delivered by version, arm broken in the act. Three preceding children had died during labor. Tumor, size of a hazel-nut, in the middle of the right sterno-mastoid, hard, not sensitive; noticed by the mother at six weeks. No torticollis; no symptoms. The infant died eighteen days after.

Case II.—Male, brought on August 16, 1889, at the age of three weeks. First child; delivered by forceps, after tedious labor. Tumor, size of a large almond, in the left sterno-mastoid muscle; not sensitive to pressure; noticed at ten days. No torticollis; no symptoms. The swelling disappeared in three months. Child examined at nineteen months; no trace.

[1] Handb. d. Chir., Bd. ii. S. 426. [2] Rust's Handb. d. Chir., S. 625.
[3] Archiv. f. Chir., Bd. xxx.; Centralbl. f. Gyn., No. 48, 1886.
[4] Nouv. Dict. de Méd. et de Chir.

Case III.—Male, seen August 28, 1890, at the age of five weeks. First child; forceps delivery after difficult labor. Tumor, size of a small pigeon's egg, in the middle of the left sterno-mastoid; noticed at three weeks. No torticollis or other symptoms. The swelling disappeared in three months. Examined at the age of nine months, no trace remaining.

Case IV.—Female, brought September 16, 1890, at eleven weeks. First child; breech presentation. Delivered by a midwife with some difficulty. Tumor in the middle of the right sterno-mastoid, size of a hazel nut; noticed at eight weeks. No torticollis. The induration disappeared in four months. Examined at eight months; no trace.

Case V.—Male, seen May 2, 1891, at two months. Breech presentation, spontaneous and easy labor. Tumor size of a hazel-nut in the upper third of the right sterno-mastoid; noticed at three weeks. A gurgling respiration was apparent when the child nursed the left breast. There was no torticollis, though slight resistance on extreme tension of the affected side.

Examined at the age of six months. No torticollis or restriction of motion. No symptoms. Tumor slightly smaller, otherwise unchanged.[1]

Case VI.—Male, brought July 31, 1891, at seven weeks. Third child, transverse with arm presentation, delivered by version and forceps. Complete paralysis of the right arm; umbilical and right inguinal hernia. A spindle-shaped enlargement of the middle third of the right sterno-mastoid, one-half inch in diameter, hard, not sensitive. No torticollis. No symptoms. Last seen September 5, 1891. No apparent change in the tumor.[2]

Case VII.—Male, seen August 5, 1891, at five weeks. First child; breech presentation, difficult labor. Tumor size of a pigeon's egg, at sternal insertion of the right sterno-mastoid; hard, not sensitive to pressure. No torticollis or other symptoms. Not again examined.

With these I now include six cases recently reported by Quisling,[3] in which the indications correspond to my own, although the actual results were not in all instances ascertained. Thus, of the thirteen

[1] Examined November 1, 1891. Swelling much smaller and softer.

[2] Examined October 24, 1891. Tumor had almost entirely disappeared.

[3] Archiv. f. Kinderheilk., 1891, Bd. xii. H. 5, 6.

cases, nine were originally breech presentations or delivered by version, two were extracted by forceps, and in two there is no history of interference with delivery. Of these cases, examined with especial reference to the subject of torticollis, in none was it present at the first examination, other than the slight limitation that might be supposed to follow a tumor of this size and character in the muscle substance, and in none of the cases traced did it follow. It should be noted also, that there are on record other instances of complete disappearance of these tumors without succeeding deformity—as, for example, cases reported by Brooks,[1] by Smith,[2] by Jacobi,[3] and many others.

Having considered the question from the standpoint of original injury, traced to recovery in all the cases cited, we may now invert the method and examine the evidence presented by cases of congenital torticollis pointing to injury at birth as the exciting cause.

At best, such evidence is unsatisfactory, because we must depend upon the mother's statement as to the time when the affection appeared. Infants do not support the head for several weeks after birth, and unless the deformity is extreme it is not noticed until that time. If, then, an infant is brought for examination at the age of six months with a history of torticollis first noticed at four weeks, we may consider it of intra-uterine origin, or that it was acquired during the first month of life, or caused by injury at birth. If we favor the first conclusion, then congenital torticollis must be divided into two classes.

First, cases of slight deformity, with no pain and but little spasm, except on extreme tension of the contracted parts, the contraction is not limited to the sterno-mastoid, but all the lateral tissues are usually involved. The resistance is not marked and the deformity can be easily overcome in a short time by stretching and manipulation. These cases are very similar to the mild condition of talipes calcaneus or of incomplete extension of arms or legs, equally amenable to treatment, whose origin would seem to be a constrained position *in utero*, leading to general shortening of tissues on the one aspect, with weakening and lengthening on the opposing surface.

[1] N. Y. Med. Record, February 27, 1886.
[2] Trans. Lond. Path. Society, iv. p. 70.
[3] Archives of Pædiatrics, March, 1888.

The second class is composed of cases in which the deformity is more marked. It cannot be overcome by simple means, but persists and increases. The sterno-mastoid may alone be affected, or the posterior group of muscles, with compensatory curvature of the spine and displacement of the scapula, as in one case now under observation. Here, we may infer, there is an actual arrest of development or muscle-degeneration—arising, it may be, from causes more complex than appear in the preceding cases.[1]

Acquired torticollis may be excluded because of the absence of enlarged glands or local pain and tenderness, which usually accompany an acute affection of this character.

In regard to rupture of muscle as a possible cause, it may be said that the tumor of true hæmatoma is so prominent when the child turns the head, that it could hardly escape the mother's notice, and her statement in this regard may be accepted as final. During the past six months I have had the opportunity of examining four cases of congenital torticollis in young infants, three of the first class and one of the second. Although there was a history of transverse presentation in one of the milder cases, in none of these, nor in those seen in later life, was there history or evidence of hæmatoma or of difficulty in delivery or probability of injury at birth.

In considering the significance of hæmatoma so called, several sources of error may be indicated, as leading to the present confusion on this subject:

1. A muscle shortened *in utero* may be ruptured at birth, thus presenting a deformity with which the induration is a coincidence and not a cause.[2] Such a case was reported by Bruns[3] at the last Congress of German Surgeons.

2. An inflamed gland adherent to the muscle, with torticollis from nerve irritation, may be mistaken for hæmatoma, as in the case mentioned.

3. Similar enlargements may in certain instances be of other origin than injury—such as fibrous, sarcomatous[4] or syphilitic tumors,

[1] Archives de Tocologie, xv. p. 494 Golding-Bird: Guy's Hosp. Reports, 1890.
[2] Rennecke: Centralbl. für Gyn., No. 22, 1886.
[3] Centralbl. für Chir., No. 26, 1891.
[4] Graser: Münch. med. Wochenschr., No. 13, 1887.

arising, it may be, *in utero*. Cases reported by Graser, Taylor,[1] Hadra,[2] and Holmes[3] would seem to support this view.

It is possible, too, that injury in a tuberculous or syphilitic child might give rise to a myositis sufficiently exaggerated to cause permanent arrest of development and actual shortening.

In regard to injury in general, this is undoubtedly an occasional cause of acquired torticollis. It might operate at birth as in later life, and hæmatoma might be a coincidence, or we may fancy that fibres of the spinal accessary nerve might be involved in the induration following muscle-rupture, with irritative spasm as a result. These, however, are simply conjectures, and are entirely distinct from the question of scar-contraction that we are considering. It may be objected that the negative evidence presented is of little value compared with positive observations to the contrary, but it must be remembered that we are considering the usual and not the exceptional causes of wry-neck, and that neither Stromeyer nor any of the succeeding writers who have indorsed this theory have presented a single undoubted case in its support.[4] Of the hypothesis, then, that explains the origin of congenital torticollis by muscle rupture, myositis, scar-contraction, and permanent shortening, we may conclude that it is simply an assertion unsupported by evidence. Further, I am convinced that injury at birth, of whatever nature or extent, is a possible, and not a probable factor in the etiology.

From the hospital records of the past nineteen years I have collected 264 cases of wry-neck. During this time[5] upwards of 3400 cases of congenital and acquired club-foot came under observation—a comparison that will show the relative infrequency of the affection under consideration.

The following is a brief summary of some of the points of apparent interest:

Of the 264 cases 32 may be considered as congenital, with the reservation before mentioned. As to sex, 155 were females and 109 males, which would tend to disprove the statement that the affection is much more common in males than in females. Excluding congenital cases, the duration of the affection was mentioned in 137

[1] Trans. Lond. Path. Society, xxvi. p. 224.

[2] N. Y. Med. Record, January 23, 1886. [3] Diseases of Childhood and Infancy.

[4] Peterson: Zeitschrift f. orthopäd. Chir., B. i. H. 1.

[5] Townsend: "Statistical Paper on Club-foot," Trans. N. Y. State Med. Soc., 1890.

instances. In 77 it might be considered as acute, and in 60 chronic, in 48 having existed for from one to twenty years.

The affected side was mentioned in 187 instances. In 98 it was on the right, and in 97 upon the left side, in contrast to the assertion that it is much more frequent on the right than the left side. Early childhood is the time of greatest susceptibility, but ten cases are noted at more than eighteen years of age.

In 106 cases of acquired torticollis the cause seemed apparent. Of these nearly 50 per cent. might fairly be classed as from cervical gland irritation, often after some contagious disease.

Age and sex of patient when first seen:

Age.	Males.	Females.	Total.
Congenital (?)	14	18	32
6 months or less	4	4	8
1 year	4	5	9
2 years	7	9	16
3 "	3	4	7
4 "	7	9	16
5 "	11	13	24
6 "	9	14	23
7 "	9	15	24
8 "	9	10	19
9 "	3	17	20
10 "	13	7	20
11 "	2	8	10
12 "	2	7	9
13 "	2	3	5
14 "	1	4	5
15 "	3	2	5
17 "	...	1	1
18 "	1	...	1
Over 21 years	5	5	10
Total	109	155	264

The apparent causes of torticollis, as noted in the records, were:

	Cases.
Enlarged cervical glands	5
Suppurating cervical glands	22
Suppurating glands after scarlet fever	11
Following scarlet fever, condition of glands not noted	7
" diphtheria	4
" mumps	5
" measles	1
" sore-throat	4
" suppurating otitis	3
" toothache	1
From cellulitis of the neck	2
	65

Other causes were:

Cicatricial, following burns	3
From injury to the neck	14
Probably of congenital origin	32
	49

Torticollis was associated with

Rheumatism	9
Fever	3
Malaria	4
	16

Torticollis was associated with disease of the nervous system as follows:

Chorea	3
Epilepsy	1
Cortical irritation	1
Hysteria	1
Infantile hemiplegia	1
After meningitis	1
Spasmodic torticollis	1
	9

The duration of acquired torticollis when the cases were first seen:

	Acute.	Chronic.
1 month or less	49	...
2 months or less	20	...
3 " "	8	...
6 " "	...	17
From 6 months to 1 year	...	13
" 1 year to 2 years	...	8
" 2 years to 3 "	...	7
" 3 " 4 "	...	...
" 4 " 5 "	...	7
" 5 " 6 "	...	1
" 6 " 7 "	...	4
" 7 " 8 "	...	1
Of 12 years' duration	...	1
Of 20 " "	...	1
	77	60 = 137

That duration of the affection is in itself a very potent factor in prognosis is illustrated by the in-patient records of 39 cases; 17 were admitted when the deformity had persisted for less than six months. Of these, 10 were cured, 4 were improved, and 3 were not improved. Of 15 cases of more than six months' duration none were cured, 6 were improved, and 9 were not improved.

Acute Cases.

Sex.	Age.	Duration.	Supposed cause.	Duration of treatment.	Result on discharge.
M.	15	3 days.	Cold.	3 weeks.	Well.
F.	9	4 months	Abscess at angle of jaw.	10 months	Not improved.
F.	9	3 months.	Measles.	4 months.	Well.
M.	8	2 weeks.	Injury.	4 months.	Much improved.
F.	9	3 weeks.	.....	4 months.	Much improved.
M.	9	2 months	Abscess of neck.	4 months	Well.
F.	8	2 months.	Mumps.	14 months.	Much improved.
F.	5	1 month.	.....	3 weeks	Well.
F.	9	6 weeks.	Suppuration of glands after scar-	4 months.	Well.
F.	8	2 months.	Scarlet fever. [let fever.	3 weeks.	Well.
M.	8	1 month.	Injury.	6 weeks.	Well.
M.	6	4 months.	Scarlet fever.	15 months	Not improved.
M.	4	5 months.	.....	9 months.	Improved.
M.	7	2 weeks.	Injury.	1 year.	Well.
F.	9	5 months.	Abscess of neck.	2 years.	Much improved.
F.	10	3 months.	Abscess after scarlet fever.	2 months.	Well
F.	9	2 weeks.	Spasmodic torticollis.	1 month.	Well.

Results.

Well,	10	Average duration of treatment, 3 months.
Improved,	4	" " " " 11 "
Not improved,	3	
Total,	17	

Chronic Cases.

Sex.	Age.	Duration.	Supposed cause, as stated in records.	Duration of treatment.	Result on discharge.
M.	10	9 months.	Cold.	1 year.	Much improved.
F.	14	Long.	Measles and mumps.	4 months.	Not improved.
F.	9	5½ years.	Enlarged glands.	3 months.	Not improved.
M.	9	7 years.	Scarlet fever.	3 months	Not improved.
M.	7	2 years.	Myositis ossificans [*sic*].	1 month.	Not improved.
M.	8	7 months.	Enlarged glands.	6 months.	Much improved.
F.	8	1 year.	Nystagmus, hyperæsthesia, etc.	14 months.	Much improved.
F.	12	2 years.	Meningitis.	6 months.	Much improved.
M.	10	5 years	Injury.	5 months.	Not improved.
F.	6	Long.	.....	7 months.	Not improved.
F.	12	8 years.	Scarlet fever.	4 years.	Not improved.
F.	8	1½ years.	Cervical abscess.	4 months.	Not improved.
F.	13	6 years.	After convulsions.	.....	Not improved.
F.	13	1 year.	.....	9 months.	Improved.
M.	10	9 months.	Cervical abscess.	9 months.	Much improved.

Results.

Well,	0	Average duration of hospital treatment, 8 months.
Improved,	6	" " " " " 9 "
Not improved,	9	
Total,	15	

It should be noted that with few exceptions these patients were treated at a time when operative interference was not recognized as an attribute of orthopedic surgery as practised at this institution, otherwise every recognized method of treatment seems to have been employed, in most instances for many months. Of four cases of long standing treated recently by open incision, one was cured, two nearly cured, and one improved, the average stay in the hospital being but three weeks.

It seems fair to assume that there is an actual arrest of development in a contracted muscle, and that the more persistent the irritation, the more rapid the growth, the more marked will be the deformity. To overcome the contraction of such a muscle it must be overstretched to a degree corresponding to the amount of previous shortening. In the neck this is almost impossible by mechanical means when the affection has become chronic in character. This affords the rational indication for treatment: to hold the head by some appliance in perfect position from the outset of the affection when rectification is easy, especially if it appears to be caused by the presence of inflamed glands, which may persist long after the original source of irritation has been removed; not alone because rest is the proper treatment for inflamed glands, or for the relief of the strain upon the nervous system of a painful deformity of this character, in itself an important factor, but that we may not have the deformity-habit with shortened muscles and fascia to deal with when active contraction is no longer present. The removal of enlarged or suppurating glands, especially if they lie about the motor point of the contracted muscle, should certainly be considered. As this often necessitates a division of the sterno-mastoid we may at once take away the cause of the irritation and remedy its result by this procedure. My time does not allow me to speak of other causes of wry-neck or of general considerations in treatment which must be governed by the indications in the individual case. They are sufficiently described in works upon this subject.

The induration that follows muscle-rupture usually disappears in from two to six months, the proper treatment being massage; if deformity is present, greater than may be explained by the character and size of the tumor, it is probably of intra-uterine origin, and should be treated on the principles that apply to that affection—

and, with certain modifications, to the acquired form that has persisted for any length of time; that is, free and early division of all contracted tissues that do not rapidly yield to milder methods, followed by the careful after-treatment which all cases of this character require. From the evidence presented, I think we may conclude, contrary to the prevailing theory, that the causes of congenital wry-neck operate in a majority of cases before birth rather than during delivery; that acquired torticollis in very young children may be as persistent in duration and as disastrous in its results as the congenital variety—the age of the child, the persistence of irritation, the arrest of development in the contracted parts, and the rapidity of growth being the determining factors; and that here, as elsewhere, the prevention of deformity in the first instance, or its rapid rectification if seen in the later stages, should be the object of our therapeutic efforts.

DISCUSSION.

Dr. Albert Hoffa said that he had made a study of the same subject, and had found that these cases could be classified as either congenital or acquired. Those of fœtal origin are always characterized immediately after birth by an atrophy of the face and neck. A child was brought to him when but eight days old, on account of a large hæmatoma of the sterno-mastoid muscle. The head was well developed, and there was absolutely no torticollis present. The mother refused to have the child treated by massage in order to avoid the development of torticollis, and about five months later she returned with the child presenting this condition. Sometimes, when the hæmatoma is due to traumatism during delivery, the hæmatoma is quite painful, and the child instinctively holds the head in that position which will give the greatest ease. About one year ago Billroth published a case in which hæmatoma occurred in a girl eighteen years of age from rupture of the sterno-cleido-mastoid muscle.

Dr. B. E. Hadra said that he claimed priority for the open operation for the relief of this condition, his paper having been published

in the *New York Medical Record* in 1884. By a remarkable coincidence, two children having this condition were brought to him at the same time and from the same place. By open incision he removed in each case about an inch and a half, and examination with the microscope showed that the muscle had entirely disappeared and that its place was occupied by cicatricial tissue. He thought it hard to believe that in so short a time such an extensive degeneration could have occurred, unless the condition was of intra-uterine origin, and it was only by the same assumption that one could readily understand the occurrence of atrophy of the muscle. In his experience it had been rare to find this condition occurring in the families of the wealthy; it seemed to be chiefly present in the offspring of the poor, hard-working women. He thought that during sudden movement in intra-uterine life the muscle ruptured, and that this explained the presence of the cicatricial tissue.

In the same way torticollis may originate intra-partum. His explanations are supported by the fact that the changes—at least in his experience—are found near the sternal insertion, where on a sudden pull the muscle would most likely tear. Also the existence of an extravasation-tumor speaks in favor of the traumatism theory. There are, no doubt, cases of cerebral origin, but they are rare; otherwise, as they are incurable, we would have dozens of cases walking the streets. But the fact is that the greatest number recover without any interference. It seems to him to be thus: If some muscular fibres be left intact in the tear, then there most probably will be spontaneous recovery; if not, and if there was sufficient time for a firm cicatrix to form before treatment, then nothing but an operation will do, and the open one will be the safest. In practice, consequently, it will be prudent not to be too hasty with operating. Some six to eight weeks ought to be allowed to the usual treatment by massage, etc.

Dr. Shaffer said that a large proportion of the cases of true torticollis which he saw were congenital, and that in the acquired cases, which were rare, the cause could usually be readily traced. In one case of torticollis he had the opportunity of measuring the muscle when the patient was six years old, and again when she was

sixteen years of age, and he found that during this period of ten years the muscle had not lengthened at all. The muscular conditions in true torticollis he conceived to be the same as in club-foot and in unilateral curvature, in all these the deformity being due to arrest of development from some obscure lesion in the motor tract of the brain. He also believed that in many cases the muscles did not grow, and could not be made longer by stretching, just as they cannot be elongated in some cases of congenital club-foot. The only way of treating these cases satisfactorily is by division of the muscles. We know what occurs to the muscles in polio-myelitis anterior, and we should devote more attention to the motor tract of the brain as well as to the motor tract of the spinal cord.

Dr. Whitman, in closing the discussion, said he desired to remind the members that his paper was divided into two parts. The first dealt with congenital torticollis, which he believed to be of intra-uterine origin—not caused by injury at birth except in rare instances. He could not accept Dr. Hoffa's absolute diagnostic point of facial asymmetry. This might be present at birth and would then be an absolute proof of the congenital origin of the affection, but he believed it to be in many instances the result of long-continued faulty position, just as a case of congenital club-foot treated in infancy may be perfectly cured, which, untreated, would in later life present nutritive changes—deformity and diminution in growth. Then, too, facial asymmetry had been noted in cases of acquired torticollis of long duration.

The case that Dr. Hoffa had mentioned, in which torticollis accompanied by pain appeared after an induration of the sterno-mastoid had been noted, he should regard as the result of nerve-irritation and not of scar-contraction. The tumors that Dr. Hadra had resected from the shortened sterno-mastoid muscles in his cases he believed to be fibrous in character, of intra-uterine origin, and not the result of the rupture of normal muscles. He could not understand Dr. Shaffer's statement that acquired torticollis was a rare affection compared with the congenital variety. Cases of acute torticollis after contagious disease, or the result of indurated or suppurating glands, accompanied by local pain, muscular spasm, and contraction were not at all uncommon. If untreated, the deformity

was very persistent, and he believed that nutritive changes with cessation of growth in the affected parts might be the cause of permanent deformity. Doubtless many of these cases, seen in later years, when evidence of the preceding irritation was no longer apparent, were classed as cases of true congenital torticollis.

The history of the in-patient cases of acquired torticollis, many of whom were discharged unrelieved after months of mechanical treatment, emphasized the importance of prevention of deformity in this class of cases. These were clinical facts which could not be lightly set aside to accommodate the conception of a dormant congenital impression which becomes apparent in shortened muscles only in later years. This was the only possible explanation he could make of Dr. Shaffer's statement that torticollis was almost always of congenital origin—a statement entirely at variance with his own experience and with the statistics that he had presented.

APPLIANCE FOR THE TREATMENT OF CONGENITAL DISLOCATION AT THE HIP.

By E. H. BRADFORD, M.D.,
BOSTON.

The case reported some years ago by Dr. Buckminster Brown is of so much importance that it would be desirable that the method of treatment be extensively carried out. The difficulty in the method is the prolonged character of the treatment, necessitating confinement to the bed for at least a year. Another difficulty is the requisite of careful nursing. It is impossible to do away with this latter, and it is only in a measure that the former can be avoided. In a case of a similar character, treatment has been conducted on the principles laid out by Dr. Brown, but arrangements have been used which facilitate the transportation of the patient, allowing the patient to sit, to be carried about, to drive, and to enjoy the opportunity of walking to a limited extent. Treatment has been carried out for three years, and a satisfactory result has at present been gained, as will be seen from the notes of the case. The accompanying illustrations indicate the means which have been used, and the manner of their use.

The history of the case is briefly as follows: The child was three years old, and a peculiarity in gait was evident. This was noticeable when walking was begun, but had increased as the child increased in size. The characteristic hollowing of the back was to be seen and the waddling gait, and on examination, it was found that a double congenital dislocation of the hip was present. The trochanter stood an inch and a half above Nélaton's line, and the head of the femur could be felt on the dorsum of the ilium on both sides. The child was in fair health. Treatment was undertaken, and the first step was to place the child in a recumbent position with a weight-and-

pulley traction upon the limb. (Fig. 1.) This was used for several months until it was found that the limb could be pulled down into position, so that the trochanter stood at nearly its normal level on both sides. When treatment was begun, the top of the trochanter stood above the level of the anterior-superior spine. It could by traction be

Fig. 1.

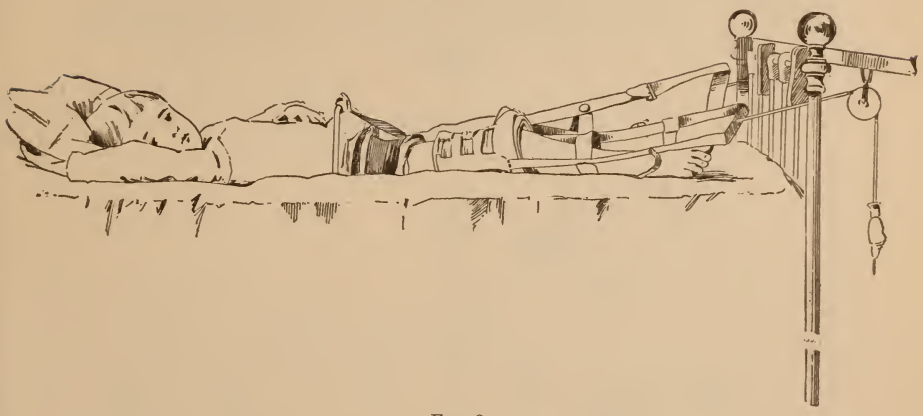
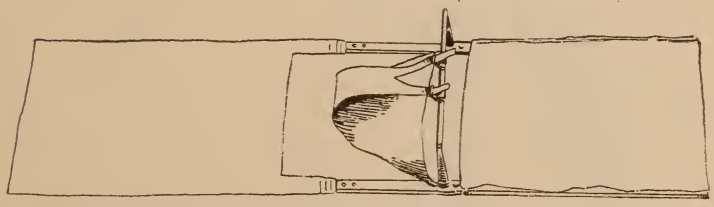


Fig. 2.



This frame is placed upon the bed under the child—the bar for the perineal stick passes over the child. In the drawing the frame is represented as tipped upward and is reversed in position from what is shown in Fig. 1.

pulled down to within one-half an inch below that point. When the limb was thoroughly relaxed in this direction, traction was made in the vertical direction. In this position the ileo-femoral ligament was relaxed, and it was possible to pull the limb into normal position with slight manual force. The object, then, of apparatus was to apply such force and in such direction that pull should not only be made downward in the axis of the trunk, but also at right angles to it; if the establishment of a new joint was begun, that the limb should always remain with the head of the femur in as near a normal

position as possible. Traction was made either in the horizontal direction with the feet slightly spread, or in the vertical position. It was desirable that the patient should be allowed to be carried about, and should, if possible, sit up. It was without difficulty arranged that the child should sit up, wearing an appliance which exercised traction of the femur at right angles to the trunk. This appliance can easily be understood from the accompanying illustration (Fig. 3). It consisted of a frame applied to the child's back and

Fig. 3.

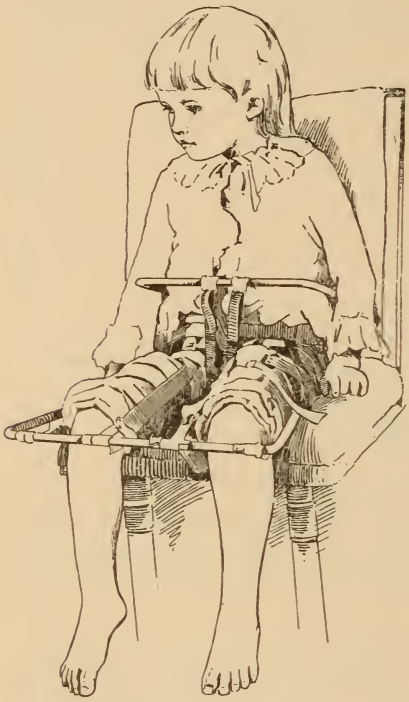
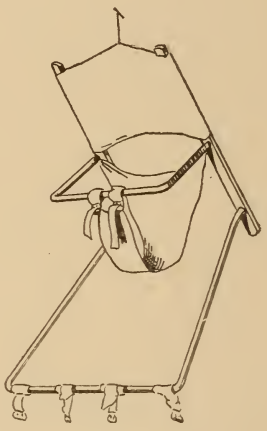


Fig. 4.



laced around the trunk. From this two arms proceeded at right angles to the axis of the trunk, slightly longer than the femur. Adhesive plaster was fastened to the thigh, and the pull made by straps connected by buckles with the ends of the steel bar. Counter-force was exerted by means of a strap over the abdomen, and by the pressure of the leather corset. By this means the patient was allowed to sit

up for a short time and could be taken for a drive. What had been gained from treatment up to this time was that the limbs could be

Fig. 5.

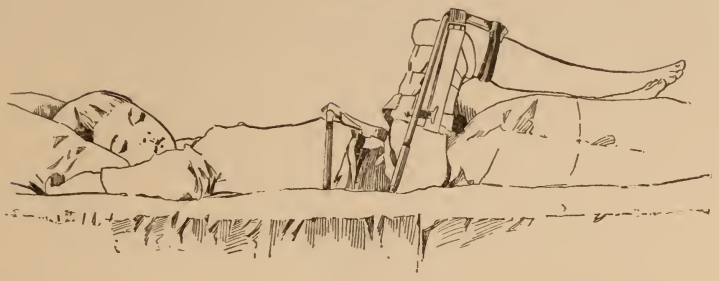
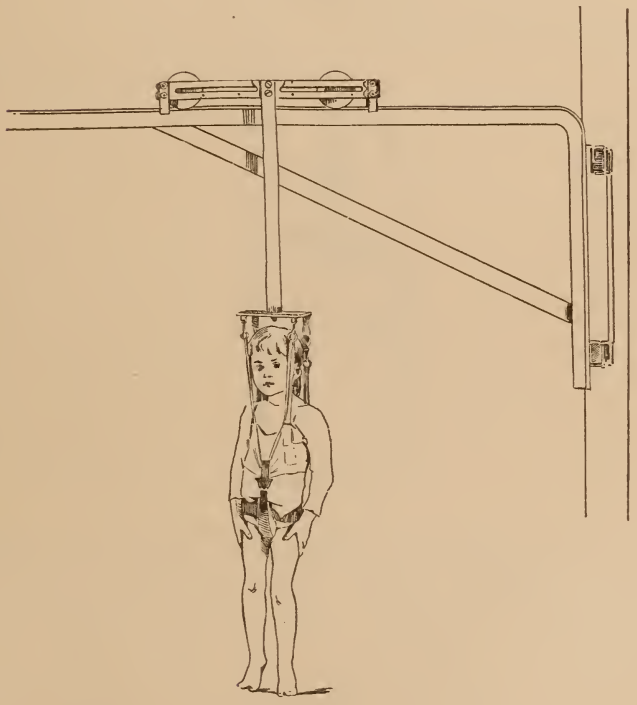


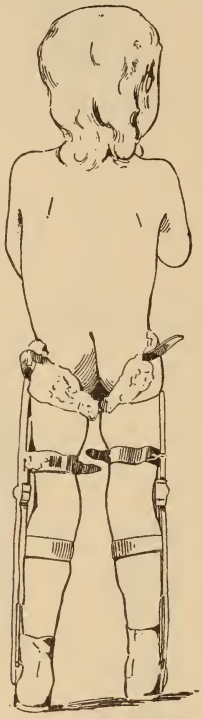
Fig. 6.



pulled in normal position, but on relaxation of the pull would slip back. Ligamentous contraction of the fasciæ was overcome. It

was then desirable that a certain amount of passive motion should be made with the limb in the normal position in order that a new socket would be formed in this position. This was done by daily manual exercise of the limbs, a strap being placed around the pelvis, over the trochanters, so as to make slight pressure of the head of the femur upon the acetabulum. The limbs were rotated with pressure

FIG. 7.



by one hand, the other being placed upon the head of the femur, preventing any slipping upward. Later, an arrangement was made by an attachment to the frame so constructed that the patient while lying upon the back would have its limbs supported with a certain amount of traction in the flexed position (Fig. 5); and in this position, through the muscular action of the child and the desire for motion, the limbs could be moved by the child in a considerable arc of motion. At the end of two years it was found that the head of the

femur not only remained in the nearly normal position in which it was placed, but that it could not by any manual force be pushed out. The child was then fastened to an appliance consisting of a perineal sling so constructed that the child could touch the feet to the floor, but could bear no weight. The arm from which suspension was made swung on a pivot, and a trolley carried the sling, allowing considerable freedom for the child. (Fig. 6.) This arrangement will be seen in the accompanying illustration. This was used for the child for nearly a year, after which splints, such as are used for protection of the hip in the convalescent stage of hip disease, were applied, which the child is now wearing. (Fig. 7.)

These splints were, for lightness, made of aluminium. At the present time the child is walking about freely upon these appliances. Some lordosis remains, but it is much less than at first and is diminishing; the rolling gait has disappeared. It is, of course, too early to report the ultimate result, and the record is here published to illustrate the method of treatment.

TEN CASES OF EXCISION OF THE KNEE-JOINT FOR DISEASE, AND THEIR LESSONS.

By JOSEPH D. BRYANT, M.D.,
NEW YORK.

The remarks that I shall make at this time will be directed only to one variety of treatment for disease of the knee-joint, namely, excision of the joint.

In presenting these cases I shall draw from my own individual experience rather than from the literature of the subject and from theoretical suggestions. This course is made especially proper not only by the short time now at one's disposal, but also by the fact that results are more entertaining and instructive than are unestablished theories. In March, 1885, my first paper on excision of this joint was presented to the Orthopedic Society of New York, now the Orthopedic Section of the Academy of Medicine of that city. In that paper two cases, each successful, were presented for examination, namely, Nos. 1 and 2 of the appended series of cases. The belief was then expressed that excision of the knee-joint was admissible for the following conditions:

"1. It should be done when remote or unsound ankylosis appears to be the only result that can be reasonably expected.

"2. It should be done when mechanical and remedial measures, faithfully applied, have failed to afford any permanent relief.

"3. It should be done for vicious ankylosis or for deformities that cannot be overcome under anæsthesia combined with tenotomy or extension.

"4. It should be done as a substitute for the expectant plan of treatment when the unfavorable surroundings of the patient, or the slow course of the disease, make hopeless or even doubtful a recovery with sound ankylosis."

I will not recapitulate now the course of reasoning that led up to these conclusions, since the conclusions themselves are not altogether new, nor are they surrounded by any uncertainty of diction. Each case, as it appears in the appended tables, is of itself quite suggestive of its history and of the final treatment which it represents.

Subsequent to this time (1887) a second series of four cases was presented before the Orthopedic Section of the Academy of Medicine. One of these cases (third of the appended series) died of Bright's disease on the thirteenth day after the operation of excision. As the result of this unfortunate termination, the propriety of the adoption of the following measures in connection with chronic diseases of the large joints or of bones was emphasized by the reader:

"1. A constant and close scrutiny should be made of the functions of the kidneys in all cases of chronic diseases of large joints or of bones, with the view of detecting the first manifestations of the consequent complications of the kidneys in these diseases.

"2. The advisability of operation in severe cases before kidney disease may become manifest; provided all other well-recognized measures of treatment have been given a reasonable trial without substantial benefit.

"3. The advisability of operation at once, when kidney disease is found to exist as a presumptive consequent complication, to limit, if possible, the further involvement of the kidneys from these causes.

"4. The use of chloroform, instead of ether, in operations with kidney involvement.

"5. A careful scrutiny of all the nooks and crevices of the joint and of the surrounding tissues, that all diseased products may be removed to prevent the infection of the fresh surfaces."

The employment of chloroform instead of ether in operations complicated with kidney involvement is not a settled question by any means, although in my judgment the conservative thinkers and workers are strongly predilected to its use in these cases. At all events, without desiring to classify myself at all in this connection, I am accustomed to use and to advise the use of chloroform in such cases.

The care necessary for the careful removal of all diseased products is too obvious to be entitled to the dignity of a mere mention, except that by so doing the attention of the operator is called to the wisdom of exercising close scrutiny, that none such may escape his attention.

Another of this number (fourth of the appended series) presented the question of the advisability of operation for the relief of long-continued and very troublesome rheumatism of the joint, attended with much pain and ankylosis, together with great demoralization of the patient. This patient was told that she would, no doubt, ultimately recover with a stiffened and insecure knee, subject probably thereafter to periodic attacks of pain and tenderness. To this prediction she replied: "If I am to have a stiffened leg anyway, why not have it at once, and avoid the suffering and confinement to be incurred by waiting? I am willing to accept any additional danger that may arise." It was thought that the result in this case justified the following conclusions:

"(*a*) Excision should be done for chronic disease of the knee-joint, when remote or unsound ankylosis appears to be the only means of securing a serviceable limb, especially when the parental or business demands of the patient must continue unfulfilled.

"(*b*) If rheumatic tendencies underlie the morbid process, all of the white fibrous tissues connecting the extremities of the bones should be removed to secure all immunity possible from subsequent attacks."

The third case of this number (fifth of the appended series) was one of vicious ankylosis attended with subluxation of the head of the tibia, together with external rotation and abduction of the leg, dependent on the omission of the proper treatment during the course of a suppurative synovitis caused by a penetrating wound of the knee-joint. The consideration of this case offered the writer an opportunity to emphasize the importance of the following facts in connection with the prevention of deformity and with the technique of certain steps of the operation for its relief:

"1. The importance of appropriate treatment during an acute arthritis dependent on injury of the knee-joint."

If moderate extension had been applied to the leg in this case the knee-joint would have become ankylosed in a proper position,

the subsequent operation avoided, and the patient's sufferings reduced to a minimum.

"2. The need of caution in making the bony sections for correction of a limb with the number of unnatural positions assumed by the leg in this instance: (*a*) Backward dislocation of the head of the tibia; (*b*) abduction of the leg from the normal line of the limb; (*c*) rotation of the leg outward; (*d*) flexion of the leg on the thigh. In this case but one section of an inch in thickness was removed from the lower end of the femur, and two, aggregating three-fourths of an inch, were removed from the upper end of the tibia. After the ankylosis had been overcome, the section from the femur was sawn parallel with the articular surface of that bone and at a right angle with its long axis. The abnormal deviations of the leg with the femur were corrected, except the posterior dislocation of the tibia, which could not be done before the section of the tibia was made. This bone was then sawn similarly to the femur, *i. e.*, parallel with the epiphyseal cartilage. The second section was made so as to permit the leg to be extended as fully as need be without causing the tissues of the popliteal space to be placed on the stretch. The hamstring tendons were not divided because all other tissues in this situation were found to be contracted as well. Neither were these tendons permitted to be made taut by the apposition of the divided bony surfaces. Had the tension of these tendons been permitted it is believed that much pain and discomfort would have arisen from reflex contractions of the associated muscles, and possibly also backward displacement of the upper end of the tibia, from the same cause.

"3. This case offers another example of the great care that should be taken to eliminate by scraping and dissecting away all the diseased tissues, osseous and otherwise, and also the attendant sinuses."

The third and more recent set of cases that have come under my treatment since the preparation of the paper in 1887 have been followed by results, thus far, entirely satisfactory.

CASE I.—Wm. K., aged twenty-one years, peddler, came under observation in Bellevue Hospital in 1887 for the first time.

Family and personal histories good.

He received the first injury of the knee in 1881. Thi[illegible]ry

was the cause of the subsequent disease. At this time he fell through a skylight, sprained the knee, and was obliged to lie still for four days only. During the next two months the knee was stiff in the mornings and caused him pain if he carried any weight. Soon after this the leg began to point outward and the knee inward, and the joint was much weakened, although not very painful.

Examination showed the leg displaced outward at an angle of about 30° with the thigh; the internal lateral ligament appeared to exercise no restraining influence on the joint surfaces; the external condyle of the femur had partially disappeared, evidently by absorption; the patella was movable and lying on the outer surface of the condyle; the knee was incompletely ankylosed; the patient walked on the anterior portion of the foot without pain. A reasonable though fruitless effort was made to correct the deformity of the limb and replace the patella. Finally, about seven years after the first injury, the joint was excised at a clinic held in Bellevue Hospital. The patella was removed through a transverse incision; such necessary sections of the bones of the joint were made as to effect correction and place the limb in a straight position. The divided bone surfaces were held in position with two silver-wire sutures passed through each bone and twisted as firmly as practicable, and horsehair drainage introduced

Union by first intention of the inner three-fourths of the wound, and non-union of the outer fourth was observed at the first dressing, three days after the operation. The outer portion of the wound and also the outer portion of the thigh suppurated, the latter suppuration extending up even to the middle and upper third of the limb. However, there was no evidence of suppuration between the sawn surfaces of the bone. The suppurative manifestations lasted about six weeks, the temperature ranging during this time from 100° to 103½° F. in the mouth. Four months after the operation the limb was solid and serviceable, bony union being present.

In the fall of 1890 the patient presented himself again at a clinic, complaining of pain and tenderness at the outer side of the knee in front. This was found to be due to one of the wires, which was quickly removed, and the patient walked joyfully from the amphitheatre, and has not been seen since. At this time the limb

was straight, painless, and shortened about one and one-quarter inches.

Case II.—James D., aged sixteen years; good family history; admitted to Bellevue Hospital January 24, 1888. Two years before admission had a sudden and sharp pain in the knee without apparent cause, soon followed by swelling and inability to walk. Six months later an abscess was opened over the outer condyle of the femur, leaving a sinus through which two good-sized bony sequestra were removed four days after admission to the hospital. At this time the head of the tibia was subluxated and abducted so that it rested principally on the outer condyle of the femur, and the joint was incompletely ankylosed at an angle of forty-five degrees. Sinuses at the outer and inner side of the joint communicated with diseased bone at the bottom. A large granulating surface, which had been caused by sloughing of the soft parts some time before from the effect of traumatism, covered the external condyle of the femur. Joint excised during a clinic at Bellevue Hospital (February 25, 1888). The method of operation was by transverse incision across the patella, extending between the condyles of the femur. Patella sawn in twain, fragments removed; ankylosis forcibly overcome by flexion; femur sawn across at right angle with its long axis below the line of epiphyseal junction; tibia caused to assume normal relations with femur as to rotation and abduction, then sawn transversely and at right angle with the shaft of the bone above the line of the epiphyseal junction, so as to permit the proper apposition of bony surfaces with the limb in a straight position; abscess cavities of ends of bones were dug out and drained through the bottom externally by means of horsehair; granulating surface over external condyle thoroughly scraped; wound drained with horsehair and rubber tubes, dressed antiseptically, and confined immovably in a wire splint which was raised from the bed by elastic suspension. Owing to profuse oozing the limb was dressed on the day following the operation; the second dressing was applied two weeks later. The soft parts healed promptly, except at the site of the scraped surface over the external condyle. However, this wound healed by granulation in the proper time. The pulse and temperature indicated nothing unusual during the entire course of treatment. The limb was

encased in a plaster splint, and the patient placed on crutches as soon as the soft parts had become well united. Three months after the operation "good bony union" had taken place, with the limb in a perfectly straight position. The patient was discharged from the hospital three weeks later with an entirely serviceable limb. I have not seen the patient since that time. This case presents no particulars worthy of special consideration, except, perhaps, the existence of the granulating surface at the condyle. It is fair to presume, I think, that if this surface had not been thoroughly treated in the first instance, so as to have precluded the possibility of infection of the operation-wound, that disaster would have resulted from such infection. It serves admirably, however, to emphasize the use of expedients already mentioned in connection with the earlier cases, such as the digging out and draining of abscess-cavities at the bony extremities, thereby economizing in bone, preserving the epiphyseal cartilage, and thus diminishing deformity as to length of limb.

Case III.—Eliza S., aged twenty-seven years; one brother died of phthisis, otherwise family history good. Since childhood the left knee had been tender, painful, and often swollen—nocturnal sharp, shooting pains especially noticeable. Almost complete ankylosis of the knee at an angle of about forty-five degrees. On November 28, 1888, excision was performed in substantially the same manner as described in the preceding case. Gelatiniform degeneration of the synovial and fibrous structures of the joint was well marked, together with isolated cheesy changes in the extremities of the femur and tibia. All diseased soft tissues were removed, cheesy products scraped out, and the resulting cavities drained with horsehair as above described. The only difference in technique between this and the preceding case consisted in the use of four steel nails to hold together the sawn bony surfaces. The case made a complete though somewhat tedious recovery so far as the bony union of the sawn surfaces was concerned. In the line of introduction of one of the nails a slowly extending caries took place, which was arrested with some difficulty after the removal of the nail and a thorough scraping of the resulting cavity. The hospital records show that the patient was discharged cured seven months after the operation. To the best of my recollection, however, there still remained a small sinus at the seat of the

carious process induced by the nail, at the time she left the hospital. At all events, the bony union was firm and the limb was serviceable at that time. The long stay in the hospital was dependent on the annoying and obstinate necrosis of the tibia before mentioned. I have no record of the patient since she left the hospital. Whether or not the caries was dependent on foreign infection in the line of the nail, or on the passage of the nail through a previously existing disease focus in the bone, I am unable to say. It would seem, however, as if the latter were the more rational conclusion, since the introduction of the other nails was followed by no ill effects, although done under circumstances presumptively entirely similar.

Case IV.—Wm. D., aged fourteen years; plumber; good family history; admitted to Bellevue Hospital January 5, 1890. At the age of two he fell and injured the right knee severely. He was treated first for a sprain; remained unable to walk for a year, at the end of which time it was discovered that he had sustained a fracture of the lower end of the femur. Splints with extension were employed for eight or nine months without any benefit. The patient became able to walk, though with much difficulty, during the next four months. At this time the joint was ankylosed in a nearly straight position. However, during the last few years, imperfect flexion of the joint had become possible. At intervals since the injury the patient had suffered from repeated attacks of synovitis of varying intensity, usually caused by sprains of the joint arising from trivial violence; in other words, the joint was insecure and fickle.

On admission the knee was found to be incompletely ankylosed, flexion at about forty-five degrees was the common position of the leg; the range of motion from this point being about ten degrees each, of flexion and extension. The leg was abducted, patella resting on the outer surface of the external condyle of the femur, as it had done for years before. At the inner condyle there was located a sharp point of bone, which had nearly perforated the integument. In short, the appearances indicated clearly that at some previous period an epiphyseal separation had taken place at the lower end of the femur, followed by displacement, upward and outward, of the lower fragment, taking the leg along, thus causing the abduction mentioned before. The sharp bony prominence at the inner aspect was the lower end of the upper fragment. The joint was neither painful nor tender at that time.

The joint was excised January 11, 1890, during a clinic in Bellevue Hospital. On exposure it was found that the femur had sustained the injuries already indicated. The bony prominence was cut off through an independent opening of the soft parts. In all other respects the technique of the operation did not vary in any essential particular from the preceding ones. The epiphyseal cartilages were not disturbed. The sawn surfaces were united by two silver sutures, one placed at each side of the bones, and caused to pass to their posterior surfaces, thus affording the best grip possible on the bones, and at the same time preventing the posterior soft parts from getting between the sawn surfaces. Wound healed entirely under two dressings, without suppuration; highest buccal temperature, 100⅘°. In six weeks the patient was sitting up, with the limb encased in a plaster splint. Nine days later was discharged cured, still wearing the plaster splint.

Four months after the operation union was firm, shortening one and one-half inches, and the patient could walk without any aid. The bones were so sawn in this case as to cause a slight degree of flexion when properly apposed. The reason for this was to accommodate the limb so far as possible to the convenience of the young man in his capacity as plumber. At the present time he is at work, and expresses himself as grateful for the slight amount of flexion, which enables him to work at a better advantage in cramped positions while sitting.

The appended table contains ten cases which were operated on during the last eight years. Only one died, and this one from chronic Bright's disease, thirteen days after the operation; in fact, operation had been refused for the reason of the existence of this disease, and it was done finally only at the urgent request of the patient, who possessed a full knowledge of its dangers. Each of the other cases made a prompt and satisfactory recovery except the seventh and eighth of the series. The delay in the eighth, occasioned by caries along the course of a nail, was tedious; still the final result was eminently satisfactory in all respects when last seen. In five of the ten cases isolated abscesses of one or both of the sawn extremities were scraped out and drained through the bottom with horsehair. These cavities closed in each instance without trouble of any kind—healing, no doubt, by means of the blood-clot process

of Schede. I usually wire the divided extremities to each other with two silver-wire sutures carried deep enough to give the best possible command of the bones, and also to exclude the tissues of the posterior surface of the joint. If possible to do so, I deem it better so to saw the bones that, with the limb extended and in proper position, the sawn surfaces will be apposed firmly enough to require the use of no special means for that. The entire patella was removed in the first nine cases. In the ninth only its lower extremity was removed; the upper extremity was allowed to remain, as it was joined to the femur by bony ankylosis. In each case, except the second and ninth, the limb was straight after recovery. In the second case it was but a trifle flexed when dressed first, but, owing to the force necessary to keep it in this position, the hamstring muscles rebelled under the undue traction and caused increased flexion. The patient declined to submit to another operation, and left the hospital with the limb slightly flexed and well united. The bones of the ninth case were purposely joined with the leg slightly flexed, for a reason already explained. The degree of shortening of a limb after epiphyseal union is not a matter of scientific importance, because the amount of bone removed must depend entirely on the extent of the disease calling for the operation, and no act of the surgeon intended to preserve the length of the limb is justifiable in this operation when it exposes the patient to the danger of infection. The artisan can supply the difference quite as effectually and with much greater safety to the patient than can the surgeon by questionable methods. The digging out of isolated disease products from the sound extremities of the bones, followed by immediate healing of these spaces, offers the only method known to me of preserving length of bone to the fullest extent.

The wires were not removed in any instance unless trouble was caused by them. In but two of the cases did it become necessary to remove the wires at any time, and in those they were removed after permanent union of the hard parts had taken place, and dependent in each instance upon external violence directed to the site of the wire. The removal was followed at once by rapid and complete recovery. It is possible, of course, that the patients did not all return for treatment of trouble caused by the wires, but sought it elsewhere.

Case.	Sex.	Age.	Operation.	Result.	Disease.	Remarks.
1	Male	16	Transverse incision; patella divided and removed; bones wired; all diseased soft parts dissected away; antiseptic throughout.	Limb straight; bony union in 3 months; good use; $2\frac{3}{4}$ inches shortening.	Fungoid synovitis two and a half years' standing; no sinuses.	Highest temperature by the mouth 101° F.; horsehair drainage; no suppuration; redressed but once; limb immobilized and swung from off the bed.
2	Male	42	Same as preceding case.	Limb slightly flexed; union firm; walked with cane when last seen; $2\frac{1}{2}$ inches shortening.	Abscess cavities at lower end of femur; joint involved; ankylosis in a fixed position; disease of 34 years' standing.	Healed under first dressing; temperature normal throughout; horsehair drainage; no suppuration; limb immobilized and swung.
3	Female	19	In addition to the measures taken in the first case, an abscess of the head of the tibia was scraped out and drained; antiseptic throughout.	Died of Bright's disease on thirteenth day after the operation from exhaustion due to vomiting.	Ostitis of extremities of femur and tibia; three years' standing; gelatiniform degeneration of the soft parts of joint; abscesses in thigh and leg.	Temperature but slightly elevated; patient had suffered from symptoms of kidney disease for long time before operation; operation done as a last resort.
4	Female	34	Transverse incision; patella removed and fibrous tissues of the joint dissected away; antiseptic throughout; bones wired.	Good union two months after operation; good use of limb; 2 inches shortening; limb straight.	Rheumatic arthritis of one year and a half standing.	Temperature record below 101° F.; wound healed under two dressings; no suppuration; rubber-tube drainage; limb immobilized and swung.
5	Male	23	Oval flap, that amputation might be done if necessary; patella removed; sinuses dissected out; diseased bone scraped out, cavity drained; antiseptic throughout; bones wired.	Good union in three months; limb straight; $1\frac{3}{4}$ inch shortening; good use of limb.	Acute arthritis following penetration of joint; numerous sinuses; nine months' standing.	Highest temperature by mouth 101° F.; but two dressings were applied; horsehair drainage; no suppuration; limb immobilized and swung; perfect two years after.
6	Male	30	Transverse incision; patella divided and removed; abscess cavity in tibia scraped out and drained; sinuses dissected away; antiseptic throughout; bones wired.	Limb straight; $1\frac{1}{2}$ inch shortening; slight motion at bony junction; cannot walk on limb three months after operation.	Ostitis of tibia and femur; granulation of joint structures with sinus openings, three years' standing.	Temperature substantially normal throughout; no suppuration; limb dressed three times; horsehair drainage; limb immobilized and swung. The delay of recovery in this case may be due to constitutional syphilis; perfect two years after.

Case.	Sex	Age.	Operation.	Result.	Disease.	Remarks.
7	Male	21	Transverse incision; removal of patella; section of both bones; extremities wired; horsehair drainage.	Limb straight and serviceable; bony union in four months; 1¼ inch shortening.	Arthritis following injury; limb displaced outward 30°, and patella dislocated and lying on outer condyle; disease not acute at time of operation; joint quite firmly ankylosed; patient walking on anterior portion of foot.	Inner three-fourths of wound united by first intention; outer one-fourth suppurated, and the suppuration involved the lower two-thirds of thigh. No evidence of bone suppuration; highest buccal temperature 103½° F.; recovered in six weeks.
8	Male	16	Transverse incision; patella sawn through and removed; extremities wired; drained with horsehair and rubber tubing; antiseptic throughout.	Limb straight and entirely healed in four months; bony union; 2 inches shortening.	Arthritis two years' standing; complicated with necrosis of lower end of femur.	Pulse and temperature but little increased; no suppuration; limb immobilized in wire splint with elastic suspension.
9	Female	27	Sawn surfaces joined with four steel nails; otherwise technique similar to preceding case.	Limb straight, and good union at the end of the seventh month.	Arthritis complicated with gelatiniform degeneration of the synovial and fibrous structures of the joint.	Caries occurred along the course of one of the nails hindering greatly the final recovery, but not interfering with the healing of the sawn surfaces. Temperature but little increased; no suppuration of the sawn surfaces.
10	Male	14	Transverse incision; patella sawn; only lower fragment removed; surfaces wired; antiseptic.	Limb slightly flexed; four months after operation bony union firm, walking unaided; shortening 2½ in.	Acute arthritis following epiphyseal separation involving the joint; lateral displacement; disease of twelve years' standing.	Highest buccal temperature 100⅘° F.; no suppuration.

ORTHOPEDIC SURGERY: ITS DEFINITION AND SCOPE.

By V. P. GIBNEY, M.D.,
NEW YORK.

At the last meeting of the International Medical Congress in Berlin, August 5, 1890, Dr. Newton M. Shaffer, of New York, presented before the Orthopedic Section a paper with this title—"What is Orthopedic Surgery?" As I listened to the paper on that occasion, it occurred to me that the author took too limited a view of the scope of this specialty. It seemed that he desired, so far as he was personally concerned, to limit his colleagues in this branch of surgery to splints and straps and buckles. The same impression, I learned, was made upon other members of this Association, and many of us naturally felt aggrieved. After the publication of the paper I took occasion to read it quite carefully, and I confess that the impression formed after reading the paper was quite different from that formed at the Congress. In the first place, on page 4 of the reprint, I find the following: "And the writer desires to state that the opinions here expressed are his personal views only, and that the committee appointed by the Orthopedic Section of the New York Academy of Medicine (of which the writer has the honor to be a member) is in no way responsible for them." Again, from page 12, I make this quotation: "In short, it seems to the writer that the orthopedic surgeon should take a step *in advance* of the general surgeon, and that his education should include all that is necessary to make a general surgeon, before his study of mechanico-therapy is commenced." On the same page, but just preceding the paragraph containing the above quotation, occurs Dr. Shaffer's definition: "Orthopedic surgery is that department of general surgery which includes the prevention, the

mechanical treatment, and the operative treatment of chronic or progressive deformities, for the proper treatment of which special forms of apparatus or special mechanical dressings are necessary."

It is safe to assume that every member of this Association is prepared to subscribe to the greater part of this definition. Take, for instance, "that department of surgery which includes the prevention." We understand that to prevent a deformity a good knowledge of the clinical history of joint disease, of paralyses, of many progressive nervous diseases, is, by all means, necessary. This is why many of us never lose an opportunity to make a plea for early diagnosis. Take, for instance, the "cerebral paralyses of children." Why is it not possible to prevent the drop-wrist and the club-foot that result from many of these paralyses? If an opportunity were afforded for an early diagnosis of the brain lesion which produces these paralyses, the means would surely be found to prevent the deformities which follow. Suppose we found ourselves enjoining or advising in the consulting-room absolute rest, the administration of ergot or bromide of potassium, would it be unorthopedic to resort to such means? We know full well that many of us would be prepared with specially devised splints to oppose muscular contracture.

Take even pseudo-hypertrophic paralysis. A neurological colleague has recently asked me to operate on the Achilles tendons of a case of this kind in order to correct the deformity. Why cannot means be employed for the prevention of this form of equinus? In "Dupuytren's contraction" an early recognition of the disease of the fascia which contributes to the production of the deformity would enable us to prevent a most distressing state of affairs. I might continue to enumerate other deformities which do come under the care of the orthopedic surgeon, requiring both operations and apparatus to secure the best possible results. My aim, however, is to analyze the definition given.

Of the many joint and bone lesions that prevail in large cities an early diagnosis may lead us to adopt means not always mechanical that will prevent deformity. I doubt, therefore, whether the final clause strengthens the definition. It certainly, in my judgment, renders the whole definition ambiguous. Suppose it read as follows: "Orthopedic surgery is that department of surgery which

includes the prevention, the mechanical treatment, and the operative treatment of chronic or progressive deformities." The paragraphs which follow I think give this impression—that in the author's opinion, no surgery is orthopedic unless it has to do with special forms of apparatus; that the orthopedic surgeon should not attempt to correct a deformity unless he requires a special form of apparatus. It matters little, therefore, how skilful one may be in the use of the knife, how thoroughly he understands the position in which a limb should be maintained after its correction. Our author, I fear, would have us believe that all this knowledge goes for naught unless, perchance, a splint is needed to complete the cure.

I am convinced that the members of this Association look upon the operative as well as the mechanical treatment of deformities as legitimately within their province. In the out-patient department of the Hospital for the Ruptured and Crippled cases present quite frequently illustrative of the necessity of supplementing operative procedures with apparatus. A knee, perhaps, has been excised by a surgeon in a general hospital. The immediate results have been brilliant, every focus of disease seems to have been removed, an inefficient splint has been applied, and the patient has been discharged. Weeks or months afterward the deformity has recurred, a deformity which requires months, sometimes years, to correct. A hip-joint has been excised. The temperature chart of the hospital where the excision was done is all that one could wish, yet the deformity is by no means corrected. The child walks on a crutch with a shortened and distorted limb. Some hideous cases of deformity in diseases of the ankle-joint have come under observation in the out-patient department after thorough operations in a general hospital. Relapsing cases of club-foot after the most approved operations are a matter of common observation.

It is not my purpose in this paper to narrate these cases. I want simply to let the profession understand that orthopedic surgery has no fight with general surgery and lays no claim to operative procedures that legitimately belong to the general surgeon. The orthopedic surgeon should be prepared to get the best possible results. If splints fail to correct deformity, then the knife should supplement. If the end of the bone, or the shaft even, is so hopelessly diseased that the life of the patient is jeopardized, then this

bone should be removed, and immediately after its removal the limb should be placed in the best position and so maintained during the reparative process. Our fight is with disease and with deformity that follows disease, with deformities that are congenital and deformities that are acquired. In some hospitals, where the general and the orthopedic surgeon can work hand-in-hand, then there is no objection to the orthopedic surgeon having the general surgeon do his operating.

The author from whom I have quoted so liberally, makes the following statement on page 14: "The remark of a prominent general surgeon to the writer, after reading the last work on orthopedic surgery, is not, perhaps, so much out of place. He said: 'The next work on orthopedic surgery will likewise tell us all about fractures and dislocations.'" I am sure the next work on orthopedic surgery will tell us how to relieve old intra-capsular fractures of the neck of the femur. It will tell us, I am sure, how to correct the deformities that follow badly united fractures and poorly replaced dislocations. The next work on orthopedic surgery, I am sure, should tell us how to cure congenital dislocations of the hip. Of the technique of operations, of course, our information can best be obtained from works on general surgery, but the after-treatment of many of these orthopedic cases should be taught us by the orthopedic surgeon.

I quite agree with Dr. Shaffer in deploring the rules of general hospitals, which rules prevent the retention of the patient long enough to secure the best results. Men the world over, I know, are too fond of brilliant operations. They like quick results. Typical healing is the great desideratum of the surgeon the world over.

Let us for a moment consider what is understood by the terms "chronic or progressive deformities" These may be classed in a general way under congenital and acquired. Torticollis, hare-lip, spina bifida, congenital dislocations, joints whose development has been arrested, the various forms of club-foot—these, in general terms, belong to that class termed congenital.

Of the acquired forms, we have the various distortions of joints dependent upon epiphyseal disease, upon peri-articular disease, and upon neuroses. We have the deformities which result from the

various paralyses, from badly united fractures, from extensive burns or wounds of any kind that shorten the muscles and fascia, the deformities of the spinal column which result from disease or from muscular or bony asymmetry.

The specialty we have adopted as a calling is as yet in its infancy. It grew out of general surgery. The most brilliant results were attained within less than a century ago by men who really knew very little about apparatus. The term itself, as our President has called attention to in his address, is derived from Greek words meaning to educate or to train up straight. Just as surely as we limit our work to the correction of deformities by means of apparatus and do not fit ourselves for operative procedures, just so surely will our specialty take a low rank in the profession. In the city of London, instrument-makers, I am led to believe, are looked upon with more favor than professed orthopedists. At the last International Congress, before the Orthopedic Section, fully nine-tenths of the papers presented at that meeting dealt with operative procedures for the correction of deformity.

In New York, thanks to the labors of Davis, Bauer, Sayre, and Taylor, mechanico-therapy has taken a higher position than it has in any other city on the face of the globe. I respect these men for their work. It is good to have demonstrated the excellent work that can be accomplished by appliances alone.

The diseases and deformities with which we have to deal are necessarily limited. It is all very well to talk about showing respect to the general surgeon and turning over operations to him. He never hesitates to do what we term an orthopedic operation. The cards announcing operations at many of the hospitals in New York are seldom posted without operations like the following: "For talipes equino-varus;" "for knock-knees;" "for bow-legs;" "for excision of the hip;" "for tubercular disease of the tarsus;" "for torticollis." It is true that the majority of our patients are sent to us by our professional brethren, yet comparatively few, I think, are sent by the general surgeon. It is the family practitioner who recommends cases to the specialists or fellow-specialists who do this sort of work. I am sure our colleagues would respect us more if we were competent to take charge of a case from beginning to end; if we were able to recognize early a disease which

produced deformity, and by this timely recognition prevent a deformity, whether we used appliances or not. They would respect us more if we were able to conduct a case of hip disease, for instance, to a successful issue, if we did get it after deformity had arisen. No one, I take it, has disputed the necessity for a thorough education as a surgeon. Even my friend, Dr. Shaffer, states in his article that the orthopedic surgeon should first be a good general surgeon, should be educated in surgery before he attempts orthopedic practice. With this education, then it is easy for the orthopedic surgeon to keep abreast with operative procedures; it is easy for him to keep posted with those operations which most speedily and successfully correct deformities. He it is whose judgment will enable him to decide whether an operation is necessary, what kind of an operation is necessary, what apparatus is needed to secure the best possible results after operation. Let us, then, divest ourselves of all this sentiment and prepare ourselves to accept that enlarged definition of orthopedic surgery, which is, that department of general surgery which includes the prevention, the mechanical treatment, and the operative treatment of chronic or progressive deformities.

DISCUSSION.

Dr. Newton M. Shaffer, of New York.—I had begun to think that my remarks on "What is Orthopedic Surgery?" read before the International Medical Congress held in Berlin, were to receive the most formidable and crushing of all criticisms, viz., the silence and neglect of my colleagues. A whole year has passed since my paper was read, and no one has been kind enough to take any notice of my attempt to define modern orthopedic surgery. I was therefore much pleased to know that another effort would be made to define orthopedic surgery by my friend Dr. Gibney, whose opinions and views we have all been glad to hear.

While I cannot but feel grateful to Dr. Gibney for his kind attempt to clear up any misinterpretation of my position, I feel, so far as our German friends are concerned, that his explanation is

unnecessary. Just prior to the reading of my essay before the Orthopedic Section of the Berlin Congress I distributed seventy-five copies of the essay translated into German; and I noticed, as I read, that many of my hearers followed me line by line. There was doubtless considerable confusion on the first day, owing largely to the fact that I read in my native tongue. But whatever doubt there may have existed was set at rest by the appearance of my essay, kindly translated by my friend Dr. F. Beely, of Berlin, in the *Berliner klinische Wochenschrift*,[1] soon after the adjournment of the Congress. I cannot understand how any of my English-speaking colleagues, who were present when I read my essay, misunderstood my plainly stated views.

As to the quotation referring to my personal responsibility for the views expressed, I feel that I ought to say that I had the honor of inaugurating the movement which resulted in the recognition of orthopedic surgery by the Berlin Congress; and that, as chairman of the committee, I should have been false to my trust if I had permitted even an inference that the committee as a whole was in any way responsible for the views expressed.

Regarding the number of titles upon the programme of the Orthopedic Section of the Berlin Congress, I find that only twelve of the thirty-five titles announced were upon surgical (operative) subjects; of these twelve, only five or six would be placed in the category of general surgery by my definition.

We have all listened with pleasure to Dr. Gibney's remarks. But he does not, I think, make it clear why orthopedic surgeons should undertake to do the work that the general surgeon is so well equipped to perform. He does not make it clear why orthopedic surgeons should not confine themselves to, strictly speaking, orthopedic work—which is as yet in its infancy of usefulness to humanity, and which has before it a career of great brilliancy.

I think we are all agreed that specialties in medicine are the natural outgrowth of a true progress; and that no specialty ought to succeed which attempts to cover, or which even invades, the well-defined limits of general medicine or general surgery. In short, all specialties in medicine should have a distinct and valid

[1] "Was ist orthopädische Chirurgie?" Berliner klin. Wochenschrift, No. 43, 1890.

reason for their existence. If we stop to ask how orthopedic surgery became a specialty, we can readily answer that it was due to the undeserved neglect of mechanico-therapy by the entire medical profession. A few earnest and intelligent surgeons have rescued mechanico-therapy from its uneviable position, and have made it what it is to-day. They did it, not by devising new operative procedures for the relief of deformity—the general surgeon did that; but by investigating and studying the mechanical principles involved in the treatment of deformity, and by inventing apparatus to meet the required therapeutical ends. Without the work of these men, the present American Orthopedic Association would have had no existence, and orthopedic surgery as a distinct specialty would scarcely be recognized to-day.

It is universally admitted, I think, that all specialists in medicine should be thoroughly equipped both in medicine and surgery, and there is no reason why one thus equipped should not practise both general medicine and general surgery. It must, however, be apparent that the so-called specialist who does this weakens his own claim to specialism and apologizes for his specialty. This will be true so long as medicine and surgery, generally speaking, are progressive and so long as there are unsolved truths awaiting the special investigator and the special student.

This, it seems to me, is especially true of orthopedic surgery. There is much to be done, much to be learned, in the mechanical treatment of deformities, while the surgical treatment of deformities will receive ample and well-prepared attention from the general surgeon. A brilliant future awaits those who will steadfastly devote themselves to the development of the scarcely taught and the comparatively unknown branch of mechanico-therapy. There are unexplored fields in sight with rich rewards awaiting the patient tiller; and while there is so much to learn, so much to be developed, and so much to be made available for the benefit of suffering humanity in these unexplored fields of mechanico-therapy, some orthopedic surgeons are content to ignore the benefit they could bestow upon humanity by perfecting true orthopedic surgery and are willing to follow more or less in the beaten paths of general surgery. And we will all admit that the general surgeon is fully prepared to perform all the operations for the relief of certain chronic deformities

and that he needs no help from the orthopedic surgeon in applying the conventional surgical dressings they require; but we also know that the early training of the general surgeon does not prepare him to apply properly devised apparatus in the more difficult cases of chronic or progressive deformity. It should be the aim of orthopedic surgeons to excel in that which gives orthopedic surgery its existence and makes it, properly interpreted, one of the most distinct and necessary of all the special branches of medicine.

Orthopedic surgery has had its first trials and has slowly reached a point from which it can look forward to ultimate success. Sooner or later it will, I think, reach a point where its followers will be true orthopedic surgeons.

In the present status of orthopedic surgery the invasion of the field of the general surgeon by the orthopedist can only be justified on the plea of expediency; but, as a matter of principle, it can never be just or wise for orthopedic surgeons to leave their undeveloped fields of true orthopedic science for the well-trodden but perhaps more attractive paths of general surgery. To mingle the two is to endanger both, especially the orthopedic part. There are very few of us who have not witnessed examples which prove this statement.

We may go anywhere in the civilized world and we shall find general surgeons who have been amply educated to perform all the operations of general surgery. The medical colleges and universities of the world are monuments to the brilliant success of general surgery. On the other hand, how many of the cities of the world contain men who have received a thorough training in orthopedic work and methods? A liberal training in our colleges and hospitals does not make an orthopedic surgeon any more than it makes an ophthalmologist or neurologist. Years of post-graduate study and work are necessary to make an accomplished specialist in orthopedic surgery; and when one has mastered the rudiments of the science —and the best of us have only done this—he will even then have to be on his guard or he will be diverted from his plain line of duty by the attractiveness and brilliancy of operative work. The true orthopedic surgeon will desire to extend the benefits of a developed mechanico-therapy to relieve the sufferings and the deformities of the human race; and he will find his time fully taken

up in one of the most attractive fields of study in the whole range of medicine. His reward will be ample, for the benefits which will accrue to humanity from a perfected orthopedic science will be second only to the grand results of operative surgery itself; but he who would strive for this goal—of the greatest good to suffering humanity—must necessarily, in the present state of orthopedic surgery, work in new fields. He must devote all his energies and time to his work, and he will scarcely have the time—even if he has the inclination—to compete with the general surgeon in the field of operative work.

The pleasure that attends the practice of orthopedic surgery needs only to be stated to be appreciated. As I have remarked elsewhere, orthopedic surgery is an exact science. The orthopedic surgeon is dealing with mathematical and mechanical problems all the time, and the application of the principles of treatment is limited only by the vulnerability of the human tissues and his therapy is regulated by his own hands. If his patience equals his confidence, the orthopedic surgeon can achieve many very brilliant results.

As long as orthopedic surgeons combine general operative surgery with their orthopedic practice, the medical profession will fail to properly recognize their position. This will accrue to the advantage of an uneducated class of instrument-makers, whose efforts to serve the profession are laudable, but whose failures are only to be expected. As long as this uneducated class are relied upon by the profession, humanity will be the sufferer, and the general sufferer will be dissatisfied with his management of cases of chronic deformity requiring special mechanical treatment. The medical profession need educated orthopedic surgeons to whom they can refer patients with chronic deformity requiring special mechanical treatment with confidence; and the orthopedic surgeons, with equal confidence and with a merited self-respect, should refer their operative cases not requiring special orthopedic care after operation to the general surgeon.

By-and-by a sufficient number of surgeons trained in orthopedic work and methods will exist, and then the profession at large will recognize their position and claims. Then the instrument-maker will be relegated to the position which the pharmacist now occupies —viz., that of "compounding" the "prescription" of the surgeon.

There is too much false pride among some orthopedic surgeons—and this false pride interferes very materially with the advance of true orthopedic surgery. Some orthopedic surgeons seem to want to be recognized as operative surgeons. They dislike, for example, to have it said: "Oh, yes, Dr. —— is good enough at applying a brace for deformity, but they say he is too timid to excise a joint." The consequence is that Dr. —— wants to prove his ability to perform all the operations of surgery. I have heard remarks like this made of some of our best orthopedic surgeons—I know it has been said of myself. But we must rise above such puerile criticism. The fact that we choose to send our, strictly speaking, operative cases directly to some general hospital or to some general surgeon places the orthopedic surgeon in a secure position; for the difficult cases which he retains and which he is competent to treat are better cared for than they could be by the general surgeon—and we know that the general surgeon is fully equipped to care for the, strictly speaking, operative cases. If we candidly study the element of humanity and progress in our work, it would seem that this would be the best for those whose interests are committed to our care.

But I must not be misinterpreted. The major work of the orthopedic surgeon must lie in the mechanical field. On the other hand, he must be prepared and equipped to operate when his work demands it, and he must keep abreast with current medical thought and practice. He is not to be a mechanic alone. But, as a matter of principle, and a logical sequence of his chosen specialty, the orthopedic surgeon should only operate upon those patients with chronic deformity who ought necessarily to remain under his care after operation. This is where, I think, the operative line should be drawn, for the function of the orthopedic surgeon should be to fill a place not occupied by the general surgeon. This position is one which all orthopedic surgeons can occupy with credit to themselves—and if it is maintained, it will result greatly to the credit of orthopedic surgery and to the benefit of suffering humanity.

I cannot but feel flattered in thinking that Dr. Gibney has adopted my definition of orthopedic surgery in every respect except the final and qualifying clause. Something has surely been gained by this discussion, and the day may not be very far distant when modern orthopedic surgery will be clearly defined.

Dr. Gibney would have the definition read as follows: "Orthopedic surgery is that department of surgery which includes the prevention, the mechanical treatment, and the operative treatment of chronic or progressive deformities."

Let us see where this would lead us. It would make the orthopedic surgeon a general surgeon in effect. He would be called upon to trephine for cerebral paralysis, to perform laminectomy for spinal paralysis, to amputate for incurable deformity, to excise diseased joints which do not require mechanical treatment, and to operate for spina bifida, hare-lip, elephantiasis Arabica, etc., and in cases requiring plastic surgery, etc.

I respectfully submit that these operations belong to that class which Dr. Gibney calls "the operative procedures that legitimately belong to the general surgeon," to which, he says, "orthopedic surgery lays no claim."

Dr. Gibney's modification of my definition would lead us far from the goal which all orthopedic surgeons should strive to reach.

On the other hand, it would appear that the definition submitted at the Berlin Congress draws a very distinct line, founded on the real traditions of modern orthopedic surgery. It places orthopedic surgery in a clearly defined position, which makes it incumbent upon its followers to operate in those conditions only which clearly demand special orthopedic care.

In order to be explicit, I again submit my definition of orthopedic surgery as read before the Berlin Congress. It is as follows: "Orthopedic surgery is that department of surgery which includes the prevention, the mechanical treatment, and the operative treatment of chronic or progressive deformities *for the proper treatment of which special forms of apparatus or special mechanical dressings are necessary.*"

Dr. Whitman said that one of the previous speakers had urged the importance of the recognition of orthopedic surgery as a specialty. Any special branch of medicine worthy of the name should be essentially complete in itself, however ill-defined its boundaries might be. If, then, the orthopedic surgeon were constantly obliged to call upon another man to aid him in the treatment of his more difficult cases, the conclusion was very apparent. He must con-

tent himself to be a subordinate rather than a master in his chosen work.

Dr. Ryan said that although the subject was of interest, orthopedic surgeons limited themselves by their actions. It was their duty to do everything possible for a case of deformity which might present itself, and he could not understand how any orthopedic surgeon could accept a service in a hospital where it was the custom for this surgeon to call upon the general surgeon to operate and finish up his work. In the West, orthopedic surgery is not distinctly recognized as a specialty; in fact, he believed there was a good deal of the same thing in New York City. We should be able and willing to do everything which will correct a deformity, whether by chisel, brace, or knife.

Dr. A. J. Steele, of St. Louis, thought that we, as orthopedists, should be educated in general surgery, but limit our practice to the prevention and cure of deformities and joint diseases. He had encountered the difficulties in the West to which allusion had already been made. Recently, during his absence, a case of Pott's disease with a discharging abscess was admitted to the hospital and taken into the orthopedic department, by his assistant, but the propriety of doing so having been questioned by one of the physicians on the ground that there was an abscess present, the general surgeon to whom the matter was referred decided that, as the abscess was connected with caries of the spine, the case had properly been classed as orthopedic. He hoped that the American Orthopedic Association would soon see fit to commit itself to a definition of what constitutes orthopedic surgery, and what might legitimately engage the attention of the Association in its papers and discussions.

Dr. R. H. Sayre said that he agreed thoroughly with what Dr. Whitman had said about a man who practises a specialty being able to bring any of his cases through to a successful termination without calling upon outside aid. To limit an orthopedic surgeon to the fitting of braces was like limiting an oculist to the fitting of glasses for the correction of errors of refraction.

DE LA SCOLIOSE DANS SES RAPPORTS AVEC LE PIED PLAT.

Par P. REDARD, M.D.,
PARIS, FRANCE.

L'étude des causes des scolioses à une importance considérable, au point de vue du pronostic et du traitement de cette affection. Les incontestables progrès récemment realisés dans le traitement de ces difformités tiennent certainement à une connaissance plus parfaite des causes prédisposantes ou réelles, de l'évolution, des altérations osseuses ou articulaires, des diverses variétés de déviations vertébrales.

Un examen clinique attentif fait connaître, qu'à côté et dans les formes classiques bien connues (rachitique, statique, habituelle, etc.), il existe des variétés assez nombreuses, à caractères speciaux, developpées sous l'influence de causes différentes. Dans tous nos examens de scolioses, nous recherchons avec soin le point de départ, la cause initiale de la maladie, ne nous contentant pas du diagnostic banal, et souvent inexact, de scoliose essentielle, habituelle. Nos études dans cette voie nous ont déjà permis de signaler quelques points étiologiques importants dans cette étude et nous avons récemment décrit les scolioses sous la dépendance de l'obstruction nasale.

Nous désirons aujourd'hui attirer l'attention sur la rapport qui existe entre certaines formes de scoliose et le pied plat.

Avec un certain nombre d'auteurs, nous avons été frappés depuis longtemps de la coexistence très fréquente de la scoliose et du pied plat. Nous avons des lors cherché à établir la relation qui parait exister entre ces deux affections. Les observations de scolioses anciennes, prononcées, observées chez des sujets présentants des pieds plats ne peuvent donner des renseignements utiles sur cette question.

Il peut y avoir une simple coïncidence, on ne peut démontrer en effet, à une certaine période de la déviation, que le pied plat à été une cause initiale efficace, prédisposante ou réelle, de la scoliose. Il n'en est pas de même, si les observations sont faites au début de la difformité. C'est au moment de la formation des scolioses, dans leur première periode, que les differentes causes des scolioses peuvent être exactement connues.

Nous basons notre description sur un certain nombre de scolioses observées au début et coexistantes avec le pied plat. De nos examens attentifs, il résulte que dans un très grand nombre de cas, on observe une déviation latérale lombaire plus ou moins marquée, que l'on reconnait facilement, le sujet étant déshabillé. La région lombaire du côté convexe est saillante, aplatie du côté concave. L'étude des triangles de la taille, conformément aux études d'A. Lorenz, démontre que le triangle du côté concave est très marqué, le triangle du côté convexe a disparu presque complètement. La courbure lombaire est plus ou moins marquée, siégeante presque toujours à gauche. Si l'on se contente de ces indications, on fera le diagnostic de scoliose lombaire, sans autre indication. Si l'on pratique au contraire une exploration plus complète, en examinant attentivement le bassin et surtout les membres inférieurs, on découvre que le bassin est manifestement incliné, les articulations sacro-iliaques, les épines iliaques antero-supérieures et postero-supérieures ne sont plus sur le même niveau, la crête iliaque du côté convexe est effacée, très saillante du côté opposé. La fesse du côté convexe est plus saillante que celle du côté concave. Le pli fessier et le pli poplité sont plus abaisses du côté correspondant à la convexité lombaire, la malléole interne du même côté est située plus bas que la malléole correspondante. Le pied du côté correspondant à la convexité lombaire est manifestement plat, souvent en valgus prononcé. La déformation de pied s'accentue surtout pendant la marche. Les mensurations précises des deux membres inférieurs par differents procédés, indiquent un raccourcissement marqué du membre inférieur du côté correspondant à la convexité lombaire. Ce raccourcissement est le plus souvent apparent et disparait lorsque la mensuration est faite le sujet dans le décubitus, le pied et le bassin placés dans une bonne position redressée. La différence de niveau des épines postero-supérieures et par conséquent l'inclinaison du bassin peut être très exactement determinée

à l'aide de l'excellent instrument, trapèze-niveau, de W. Schulthess. En corrigeant enfin le raccourcissement du membre, au moyen de plaques de liége placées sous le pied plat, ou en rétablissant la voute plantaire affaissée, on arrive à modifier la courbure lombaire et à la faire même presque complètement disparaître, lorsque la scoliose est de date récente.

La forme de scoliose que nous venons de décrire est assez fréquente. Sur nos 100 dernières observations de scolioses, nous trouvons en effet 12 scolioses lombaires avec raccourcissement d'un des membres inférieurs, qui nous paraissent développées sous influence du pied plat. Dans 3 cas, il existait une légère courbure de compensation dorsale avec gibbosité, modification dans la hauteur des épaules, etc. Dans 2 cas, nous avons pu suivre la marche de scolioses primitivement lombaires avec pied plat et raccourcissement manifeste d'un des membres inférieurs qui se sont compliquées de déviations dorsales, avec gibbosité et la plupart des caractères des scolioses dites essentielles ou habituelles. Dans 2 cas, il s'agissait de scolioses totales ayant débutées par la region lombaire.

Ainsi que nous l'avons indiqué, la courbure lombaire siège presque toujours à gauche, 10 fois à gauche, sur nos 17 cas de scolioses lombaires au début, sur 100 cas de scolioses.

Le pied plat est généralement double plus marqué d'un côté, avec valgus plus ou moins prononcé, s'accompagnant rarement de phénomènes douloureux. Dans un cas, il existait à la fois un pied plat et un genu valgum unilateraux.

Les scolioses que nous venons de décrire doivent être rangées dans la catégorie des scolioses dites *statiques*, dont la très grande fréquence est aujourd'hui admise par la généralité des orthopédistes, le pied plat, affaissé, s'accompagnant d'une attitude vicieuse et d'un raccourcissement d'un des membres inférieurs, modifiant les conditions d'équilibre du tronc et produisant une déviation vertébrale. Elles doivent être rapprochées des scolioses statiques par inégalité des membres inférieurs, congénitales ou acquises, dont elles présentent la plupart des caractères. Parmi les causes produisant l'inégalité des membres inférieurs, le pied plat doit être placé en première ligne.

Ces observations viennent à l'appui de la théorie qui admet qu'il y a analogie complète entre la scoliose d'attitude et la scoliose statique. Elles expliquent en partie la très grande fréquence des scolioses lombaires, notée dans les récentes statistiques.

La scoliose lombaire coïncidant avec le pied plat, peut être considerée au début, dans quelques cas, comme une fausse scoliose, scoliose par flexion latérale de Bouvier, mais dans la majorité des cas, les attitudes vicieuses prolongées, sous la dependance du pied plat dans nos observations, agissant sur un rachis en pleine croissance, s'accompagnent des mêmes lésions que celles de la scoliose essentielle (scoliose vraie). Tous les sujets qui ont des pieds plats ne sont certainement pas atteints de déviations du rachis, mais dans un très grand nombre de cas, la difformité des pieds, existant sur des sujets prédisposés, est une cause d'une grande valeur. Dans nos observations, la déviation vertébrale s'est toujours montrée de 10 à 15 cas, au moment de la période de croissance, exceptionnellement chez de très jeunes sujets. Dans ces derniers cas, il s'agissait de pied plat et de scoliose sous la dépendance du rachitisme. Les rélations de cause à effet entre le pied plat et la scoliose nous paraissent démontrées par les résultats de l'observation clinique de scolioses au début coexistant avec le pied plat, par l'évolution de l'affection, par l'influence favorable du traitement.

Le traitement, consistant à modifier les conditions statiques défectueuses en traitant le pied plat, en corrigeant le raccourcissement du membre inférieur par des semelles de liége appropriées placées dans les souliers, en recommandant l'usage de sièges inclinés, donne en effet d'excellents résultats. Le traitement anti-statique, employé seul, à suffi dans nos observations pour enrayer la marche de l'affection. Le pronostic de ces scolioses, traitées au début, est très favorable.

En résumé, nos observations démontrent que, dans un très grand nombre de cas de scolioses, il existe une relation évidente entre le pied plat et la déviation vertébrale. L'inégalité de longueur des membres inférieurs, conséquence de la difformité du pied, s'accompagne d'attitudes vicieuses prolongées, qui sont suivies de véritables scolioses. Après les attitudes vicieuses dans la position assise en écrivant, le pied plat est une des causes initiales les plus fréquentes des scolioses.

Dans toutes les scolioses au début, il importe d'examiner les membres inférieurs et de rechercher attentivement s'il n'existe pas un pied plat ou toute autre cause d'inégalité des membres inférieurs.

A CONTRIBUTION TO THE PATHOLOGICAL ANATOMY OF SCOLIOSIS.

By F. BEELY, M.D.,
BERLIN, GERMANY.

GENTLEMEN: The subject that I take the liberty of presenting to you makes no pretensions to novelty; it is simply a description of what may be seen by carefully observing a scoliotic vertebral column. If, however, the demonstrations with which I shall attempt to illustrate my paper should meet with your approval, I shall have accomplished my object.

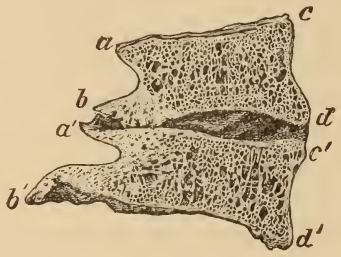
I may presume that you are all conversant with the anatomy and physiology of the vertebral column, and only here call your attention to the fact that this structure may be divided into an anterior column formed by the bodies of the vertebræ, and a posterior column formed by the arches. I shall in this paper designate the former as the *body-*, the latter as the *arch-column.*

The elasticity of the intervertebral cartilages tends to lengthen the body-column, while the arch-column is shortened through the elasticity of the yellow ligaments. If we separate one from the other we obtain a difference in length amounting to three and a half to six centimetres. The arch-column is not only less movable in a longitudinal direction than the body-column, but its lateral motion is also inhibited by the transverse and articular processes, by the ribs, the ligaments, and surrounding muscles. The difference in the flexibility of the body- and arch-column varies considerably in different parts, the difference being least in the cervical portions, more marked in the lumbar, and greatest in the dorsal portion. Another characteristic feature in the relation between the two rows is that only the body-column is acted upon by the weight of the body; therefore, the forces that produce deformity act only on the latter column.

The osseous tissue possesses, as long as it is part of the living organism, a high degree of plasticity and formative power. Traction and pressure are the forces by which changes in the form of the bones are gradually brought about, time, of course, being necessary, and after a certain lapse of time the original form of bone may have become so altered that it is almost impossible to recognize it. The change—it is, of course, hardly necessary to say—is not produced in the same way as if we take a piece of clay and mould it. On the contrary, we have reason to believe that the traction and pressure act as stimuli in such a way that the osseous tissue required to build up the bone is deposited in those places where the forces of traction and pressure are strongest; the shape of the bone, however, is likewise influenced by these forces, but the macroscopic increase and growth occurs in the direction of least resistance, or, in other words, in the direction of the traction.

Let us take, for example, the section of a wedge-shaped scoliotic vertebra, which instead of occupying a rectangular area has grown into the area *a b d c*, *or a′ b′ d′ c′* (Fig. 1); we find that the hori-

Fig. 1.



zontal diameters *a c*, *b d*, *a′ c′*, *b′ d′* have become elongated in the direction of *a b* and *a′ b′*, the vertical diameters at *a b* and *a′ b′* have become shorter than the vertical diameters at *c d* and *c′ d′*. At the same time the vertebra has gradually changed its interior structure, being now sclerotic at *a b* and *a′ b′*, and comparatively rarefied and porous at *c d* and *c′ d′*. We might consider the bone atrophied at *a b* and *a′ b′*, and hypertrophied at *c d* and *c′ d′*, but must not forget at the same time that the atrophy in the vertical direction is accompanied by a hypertrophy in the horizontal, and *vice versa*.

Traction and pressure, therefore, according to the degree, the manner, or the length of time in which they act, may cause an increase or a cessation of the development of the osseous tissue. (At the epiphysis, however, the growth of the bone seems to be affected differently, the proliferation of tissue being sometimes in the direction of the greatest pressure.)

Let us now turn to the motions which the vertebral column is capable of, and which are of interest to us in connection with our subject. The vertebral column can move as a whole—

1. About a *frontal* axis, which movements we will designate as *ante-version* and *retro-version.*

2. About a *sagittal* axis; the resulting displacement being a *latero-version,* either a *dextro-* or *sinistro-version.*

3. About a *vertical* axis, causing *rotation,* which is either *dextro-* or *sinistro-rotation.*

But the individual segments of the vertebral column—*i. e.*, the vertebræ—are independently capable of motion, and about the same axis as the whole column. We may designate in a similar manner movements of the single vertebræ, as *ante-* and *retro-version, dextro-* and *sinistro-version, dextro-* and *sinistro-rotation* of the vertebræ. These movements of the vertebræ produce the following changes in the form and shape of the vertebral column depending upon the axes about which they rotate:

Ante-version of the vertebræ, *ante-flexion* of the spine.

Retro-version of the vertebræ, *retro-flexion* of the spine.

Dextro-version of the vertebræ, *dextro-flexion* of the spine.

Sinistro-version of the vertebræ, *sinistro-flexion* of the spine.

The movements of the vertebræ, so far, we must consider as having been always in the same direction as the whole column. If, however, this is not the case—that is, if the rotation of the vertebræ is at one place in one direction, at another in the opposite—the result produced is as follows: Combination of *ante-* and *retro-version* of the vertebræ produces *antero-convex* or *postero-convex* curvature of the spine, *lordosis* or *kyphosis.*

Combinations of *dextro-* and *sinistro-version* of the vertebræ produce a *lateral dextro-* or *sinistro-convex* curvature of the spine.

Rotation of the vertebræ causes a *torsion* of the spine; the *dextro-rotation* being followed by a *dextro-torsion,* the *sinistro-rotation* by

a *sinistro-torsion*. All these different movements occur in the normal vertebral column, but only within limits, only so far as is permitted by the restraining action of the normal ligaments, intervertebral discs, articular processes, muscles, etc. In the scoliotic spine the movements exceed the normal physiological limits and cause permanent changes in the individual segments. What these changes may be I will attempt at least in part to demonstrate.

The normal spine has only one fixed, unchangeable curvature—the so-called physiological dorsal kyphosis—lordosis being in most individuals a temporary condition existing only while the erect position of the body is maintained; in the sitting and horizontal posture the lordosis disappears. If we examine the normal dorsal vertebra of the newborn child, Fig. 2 (*Hueter*), and of the adult,

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

Fig. 3 (*Lorenz*), and compare them with the corresponding lumbar vertebræ, Fig. 4 (*Henke*) and Fig. 5 (*Lorenz*), we notice at once that in the dorsal the *antero-posterior* diameter is very much longer than the lateral, the difference being most marked in the vertebra of the adult. The body of the vertebra of the adult has a greater antero-posterior than lateral diameter, the lumbar vertebra a greater lateral than antero-posterior diameter. The increase is in the ante-

rior portion of the bone, on the concave side, in the portion subjected to the strongest—the vertical—pressure; while in the posterior portion, the convex side, we find a flattening of the vertebra—that is, viewed in horizontal projection, including the spinous process. The spinous process projects relatively less in the adult vertebra than in that of the infant, and less also in the dorsal than in the lumbar vertebra. One might be led to state that as the sagittal diameter has increased on the portion of the vertebra submitted to pressure, the concave side, it has correspondingly diminished on the side subjected to the force of traction—*i. e.*, the convex side.

The convex side, however, is only the traction side in the vertical plane; it is the pressure side in reference to the horizontal plane.

The concave side, on the contrary, is the pressure side for the vertical, traction side of the horizontal plane, and we find, therefore, the dorsal vertebræ wedge-shaped with the narrowing side in the direction of the concavity.

(Not so, however, with the lumbar vertebræ. The anterior and posterior portions of their bodies are subjected to pressure alternately; they are, therefore, more or less of even height. The spinous processes are subjected at times to a pressure acting upon them from behind forward, as in sitting or lying; at other times the pressure exerted upon them is in the direction from before backward, as in standing. Their direction is, therefore, horizontal; in walking, however, the pressure acts alternately on either side of the body of the vertebra, and we may perhaps attribute the somewhat marked increase in their transverse section to the stimulus produced on the sides of the body by the alternating pressure.)

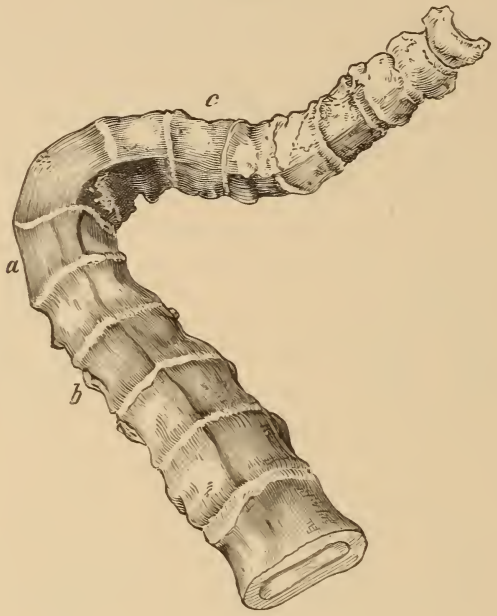
Similar, but more strongly marked, conditions we find in the vertebræ of the scoliotic spines. As the changes, however, differ in the different vertebræ, it will be advantageous to bring the individual vertebræ into groups for the purposes of description. A sufficient and easily understood classification may be made by dividing the vertebræ into three groups: The *wedge-shaped, rhomboidal,* and *transition* vertebæ.

We find the *wedge-shaped* vertebra at the site of greatest lateral curvature (Fig. 6, *a*), the *rhomboidal-shaped* vertebra where one curvature passes into another pathological one, or into the normal curve of the spine (Fig. 6, *b* and *c*), while the *transition forms* are,

as a rule, situated between the rhomboidal and wedge-shaped vertebræ.

You have already heard what changes we may expect to find on the wedge-shaped segments. To recapitulate: Increase in the horizontal direction, with a corresponding decrease vertically on the

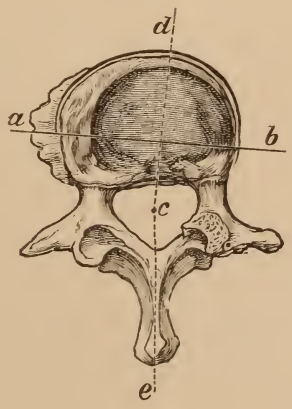
Fig. 6.



concave side. Increase in the vertical diameter on the convex side, with a probable decrease of the horizontal diameter. Figs. 1 and 7, representing a lumbar vertebra with the convexity to the right, show the increase in the direction of *a*; Fig. 6 demonstrates the wedge shape at the point marked *a*. The accompanying change in the internal structure of the bone I have already referred to. Similar and corresponding changes can be studied on the oblique and transverse processes, on the ribs, and on the spinous processes. To point them out in detail would lead us too far. The changes which have been noted on the wedge-shaped vertebræ I will designate as *flexion phenomena*.

The rhomboidal vertebræ—*i. e.*, those vertebræ whose vertical axis had been turned more or less toward the horizontal plane (compare *b* and *c*, Fig. 6)—at times the vertical axis may become the horizontal axis—present an entirely different appearance. We can understand the changes that have taken place by considering the superior surface of the vertebra to have been displaced horizontally, the inferior remaining fixed. The lateral surfaces cease, therefore, to be perpendicular to the upper and lower surfaces, but join them at a more or less acute and obtuse angle. Of course, the structure of the bone, as also the original dimensions of what were

Fig. 7.



formerly upper and lower surfaces, the arches, spinous processes, etc., are also altered. But as these are more or less hypotheses, I will not follow out this subject more closely. All these phenomena just described, which we find, as a rule, most marked at the places where one right lateral curvature, for instance, merges into a left lateral curvature, or *vice versa*, I will comprise under the head of *version-phenomena.*

To conclude the subject, I need only to refer to those changes which are due to and can only be explained by the act of *rotation* or *torsion* of the vertebra. I have already referred to the factors which cause the phenomena of rotation. You are all acquainted with Dr. Judson's beautiful explanatory model. The *arch-column*

owing to its more covered and confined position, being fixed, remains in place while the vertical pressure already referred to causes a lateral deviation of the *body-column.* A rotation of the vertebra is the natural consequence, the rotation depending upon the character and position of the vertebra, whether it be a dorsal or lumbar, or whether the rotation occurs in a vertebra that is already kyphotic or lordotic. A dorsal vertebra belonging to a right-convex dorsal scoliosis has undergone the following compound motions: A motion backward, and a lateral motion which may be considered as a motion of rotation around an axis situated in front of the body, then a second motion, rotation around an axis situated behind the body. A lumbar vertebra belonging to a left-convex lumbar scoliosis has undergone a motion forward and a lateral motion, which may be considered a motion of rotation around an axis behind the vertebra, and a second motion of rotation around an axis situated also behind the body of the vertebra. As the body of the vertebra rotates, while the arch remains fixed, the vertical pressure producing a lateral deviation of the body, a break in the sagittal axis results. The axis, originally a straight line, will now be two lines which meet in an angle whose opening is toward the side to which the body had rotated. (Compare Fig. 7, *d c e.*) This may not, however, be the only form which the sagittal axis may take in the scoliotic vertebra. Only a large number of careful investigations will elucidate this point. In such a vertebra we will also expect to find corresponding changes in the articular and transverse processes, etc. The changes so produced I would prefer to classify as *rotation-phenomena*, although I am aware that they are really the results of *torsion* (upon a horizontal plane).

We will find the changes most marked on those vertebræ which are nearest to the point of greatest lateral curvature—*i. e.*, on the wedge-shaped. On the rhomboidal vertebræ the influence of the relative rigidity of the arch also makes itself apparent, although in a somewhat different manner. The body of the vertebra inclines—*i. e.*, turns about its sagittal axis; the spinous process being almost fixed, or, having less movability, causes a *torsion* of the vertebra about its sagittal axis; the result is that the vertical antero-posterior planes (the median planes) of the body of the vertebra and its spinous

process, which were formerly one, now form an angle of more or less degree. We shall find corresponding changes of the articular and transverse processes, ribs, etc., on these vertebræ. The changes just now described I might designate as *torsion-phenomena.* We find them most marked on the rhomboidal vertebræ.

Let us now examine a spine with a right-convex dorsal and a left-convex lumbar scoliosis; we will find at the point of greatest lateral deviation the *flexion-* and *rotation-phenomena* most marked; at the point of transition of the right-convex to the left-convex curvature the *version-* and *torsion-phenomena,* and in the neighborhood of the normal spine above and below the curvature, we will find *flexion-* and *rotation-phenomena* in those vertebræ nearest the normal, *version-* and *torsion-phenomena* in the adjoining vertebræ.

I must admit that all these changes might be explained as due to *torsion.* But I believe it to be more easily understood and also more in accordance with the actual condition to do as I did, as we can explain the phenomena of flexion and version without having recourse to rotation and torsion.

In conclusion, I would like to bring to your notice a striking symptom which, however, I am not aware is present in all scolioses. In viewing from behind a spine having a right-convex dorsal and a left-convex lumbar scoliosis, we cannot fail to notice that the *sulcus paraspinosus* is very shallow and broad on the concave side, deep and narrow on the convex side. In the lumbar region we should expect to find the opposite; but here the groove is shallow and broad on the convex, and deep and narrow on the side of the concavity.

We may explain this fact by assuming that the ribs exercise a pressure upon the transverse processes on the convex side of the dorsal curvature, while on the concave side they tend to pull the transverse away from the spinous processes, thus widening the sulcus. In the lumbar region, however, the transverse processes are unencumbered, and it is rather the spinous processes which remain fixed owing to the muscles supporting them.

(I cannot omit to express my sincerest thanks to Professor Dr. Kolliker, who had the kindness to supply me with great liberality with a great many preparations for my purposes.)

Fig. 8.

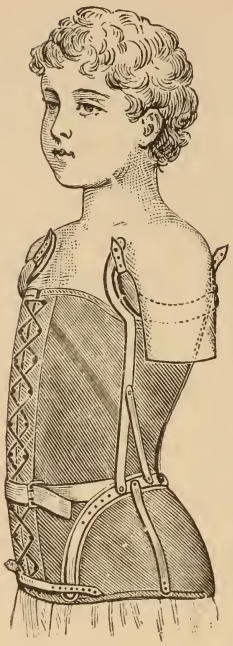
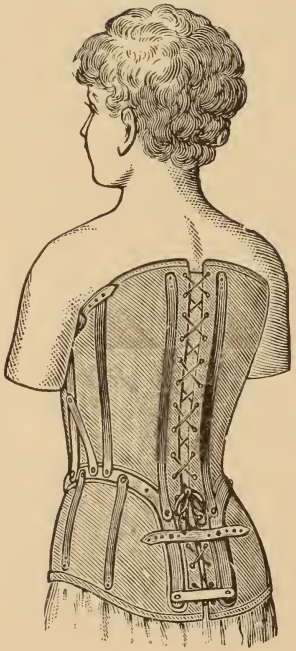


Fig. 9.

Fig. 10.



Figs. 8 and 10 illustrate the corset used by Dr. Beely in scoliosis, and exhibited in connection with this paper. The corset is also used in spondylitis, and Fig. 9 illustrates the head-supports for disease in the upper dorsal and cervical forms.

DISCUSSION.

Dr. Shaffer thought that all the members must have been delighted with the clear demonstration to which they had just listened. It has been said that rotation of the lumbar spine is impossible on account of the locking of the transverse processes, but clinically we know, as Dr. Beely has pointed out, the bones themselves give way at their weak points, and rotation does actually occur. We find that the sulcus in which the erector spinæ lies, is enlarged on one side and narrowed on the other, showing the action of a very comprehensive force. True scoliosis is accompanied by changes in the bone, which are not due simply to position or gravity; and whatever the cause, the force must be very great. In many cases the growth of the vertebral bone is impeded by an irresistible muscular shortening, due to an actual arrest of development of the muscles controlling especially the intrinsic spinal movements.

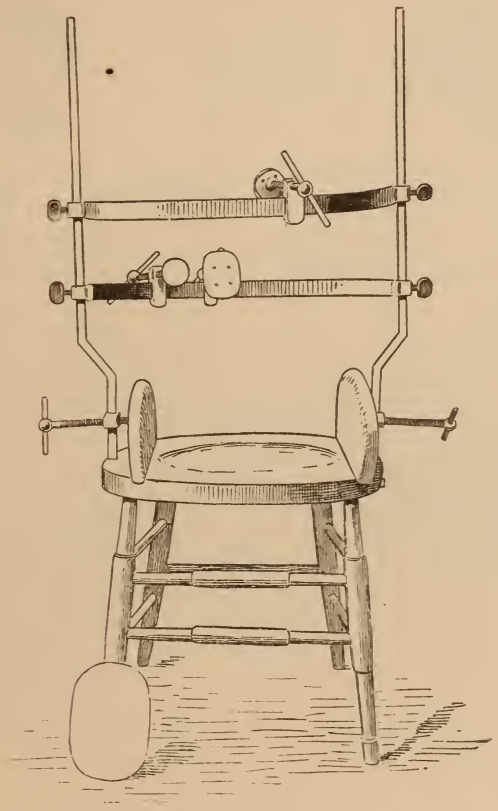
METHODS OF FORCIBLE CORRECTION OF LATERAL CURVATURE.

By E. H. BRADFORD, M.D.,
BOSTON.

It will be remembered that Lorenz, of Vienna, introduced some years ago a means of increasing the flexibility in rigid curvatures of the spine by means of forcible correction, using more force than has hitherto been employed. The method devised by him was a simple one, and has been extensively copied, and the illustrations showing his method have been published in medical magazines and text-books, so that the method is now well known. Modifications of his appliance and arrangement for forcible correction have been made and used by Beely, Redard, and by the writer of the present article. These have already been published. Another means of forcibly correcting rotation has been suggested to me by Dr. Burrell, of Boston, who has devised an arrangement having this object in view. His appliance will be described and published by him. The accompanying illustration will serve to show an appliance which is designed for the purpose of exercising in correction of rotation. An ordinary wooden chair is taken and the back removed. At each side are two steel bars, firmly fixed, between which the patient is to sit. From each of these bars a screw is attached which can be moved toward the inner side of the chair, and at the end of the screw is a broad wooden plate, which is designed to secure fixation at the pelvis for a patient seated in the chair. Semicircular bands of strong steel are applied with such an attachment that they can be slipped over the upright rods, one being placed in front and one behind the patient. The height to which these are placed can be adjusted by means of set screws.

To this can be attached rods with a screw-thread at any point along the semicircular band. These rods are secured by being slipped upon the band as they play through a steel clamp. At the end of each is a small plate designed to press upon the patient's trunk at any given point. The patient is seated in the chair, under

Fig. 1.



a tripod, and is suspended or suspends himself, the pelvis is secured, and the semi-rings applied. A band is placed across the patient's back at the level of the shoulders and a strap fastened around the projecting shoulder is secured to the steel band behind, which prevents any rotation of the shoulders. The steel screw rods are then twisted, and the plates pressed against the trunk, protected by a

plate of wood or brass. If the screws are applied, it will be found that the rotation of the ribs can be completely over-corrected without pain to the patient, in many instances even where the curve is an obstinate one and not to be corrected by manual pressure. The patient sits in the appliance and can remain there for ten or fifteen

FIG. 2.

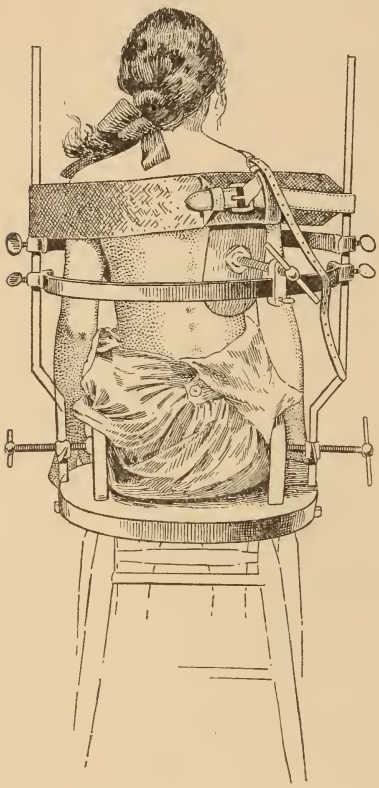
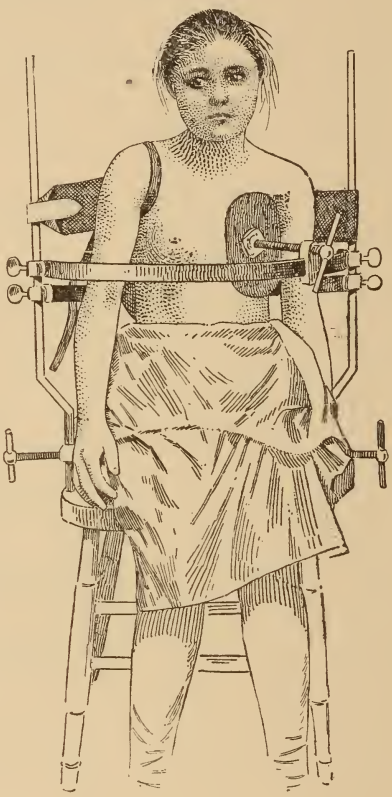


FIG. 3.

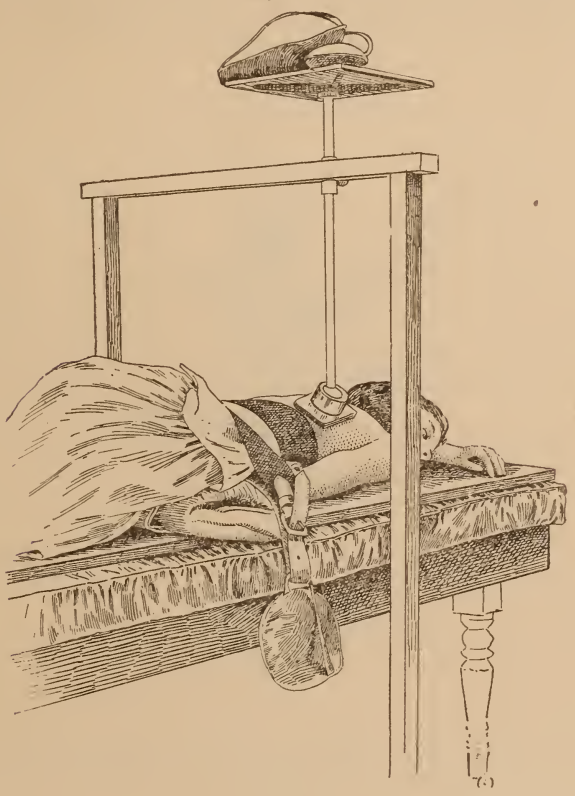


minutes, and on deep respiration the flat side of the thorax will be found to expand, the projecting side prevented from expanding. In this way an exercise is devised for the direct correction of a flattened chest. This exercise can be used from twenty minutes to half an hour without discomfort to the patient, enough force being used to over-correct the torsion.[1]

[1] In the first number of the Zeitschrift f. orthopädische Chirurgie, Hoffa describes an excellent arrangement designed for a similar purpose and on the same principle.

Beely, of Berlin, has employed a method of correcting lateral curvature by causing the patient to lean upon a padded stool and hanging weights upon the trunk, so designed as to pull against the projecting curve. The appliance is designed to increase the flexibility of the spine, which it can undoubtedly do. The objection to

Fig. 4.



the arrangement is simply that the patient is obliged to remain in an uncomfortable position, which necessarily limits the time during which the treatment can be carried out. The arrangement depicted in the accompanying illustration has been used by me to exert pressure over the projecting deformity and to correct rotation, the patient being in a recumbent position, and for that reason free from muscular strain and fatigue. The patient lies upon a board, a

sand-bag or padded cushion being placed under the projecting ribs on the distorted side in front. A pillow is placed under the hips and under the face, if necessary; the patient lying with the upper part of the thorax leaning chiefly upon the left arm, the face being turned to the right in the ordinary right-convex distortion. Across the lounge on which the patient lies is a light frame, which holds a steel rod which slips up and down. At the top of this rod is a plate on which the weight can be applied; at the lower portion of

FIG. 5.

the rod is a steel plate moving on a ball-and-socket appliance designed to press upon the projecting curve. The patient lies under this frame and the rod is made to fall upon the projecting ribs. Weights can be applied upon the upper plate and the amount of pressure regulated. This appliance is designed to correct rotation, but it can be combined with means to correct lateral deviation if broad straps are passed around the patient's trunk, hanging over the edge of the couch on which the patient lies, and the weights are attached to the straps.

Lorenz, in the International Congress at Berlin, described a

method of self-correction in lateral curvature. The accompanying illustration will depict a similar arrangement. The patient stands under a frame from which is supported the ordinary suspension appliance. The head-sling is applied and the patient suspended. Broad straps are passed around the trunk above at the thorax, below at the hips, and in the middle at such place as the counter-pull is necessary. These broad straps are connected with cords which pass

Fig. 6.

through pulleys, and are so arranged that two of them can be connected with handles pulled by the patient. The patient on pulling with the arm can over-correct the lateral deviation, and be placed in a position where the trunk is as straight as possible. This can form a daily exercise.

These different methods can be used alone or in combination with other exercises to increase the flexibility of the spinal column, as a preparation to a treatment by special gymnastics, or to be followed by the application of a plaster jacket in a corrected attitude. A statement of the results obtained by gymnastics or of fixation in a

forcibly corrected attitude does not fall within the limits of this article, which is simply designed to call attention to some of the newer methods for increasing the flexibility of the spine in scoliosis, to the desirability of attempting this increase, and to state that it has been found by the writer that a marked gain can be obtained in moderately resistant scoliosis by the use of the arrangements here mentioned.

METHODS OF RECORDING SCOLIOSIS.

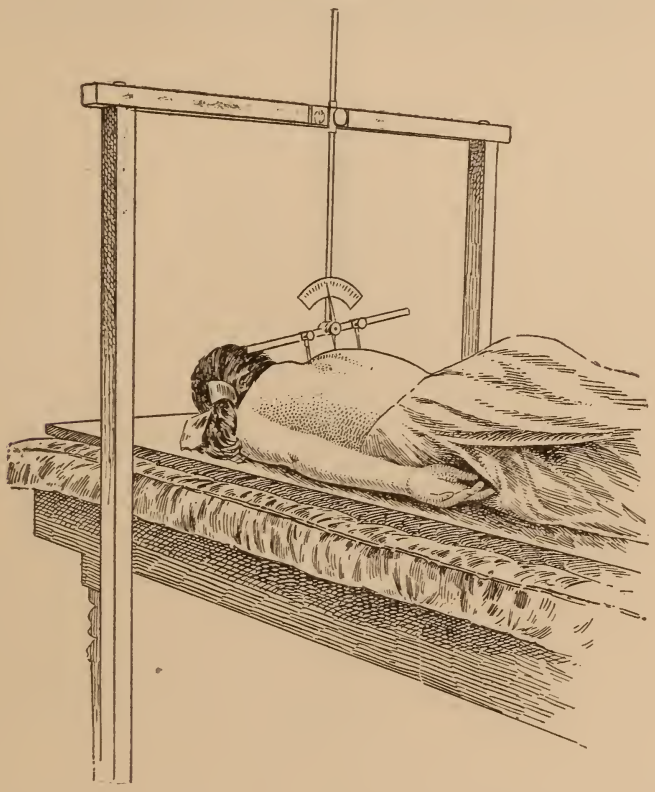
By E. H. BRADFORD, M.D.,
BOSTON.

The need of accuracy and simplicity in recording scoliosis is one that will be admitted by all. An examination of the different methods that have been used shows the difficulty of the problem and the great variety of ways in which this has been attempted. Of all the methods photography has hitherto been regarded the most satisfactory, for that is most simple, and would appear to be accurate. An examination will show that, although this method has certain merits, it is not reliable. Owing to the difference in the lights and shadows, the contour of the trunk may appear differently at different times, and it is unable to record thoroughly rotation, which is, after all, a feature of the greatest importance. The method of tracing by means of lead is uncertain, and it is easy for a surgeon to deceive himself in using this method. A method by means of measurement is not thoroughly reliable, from the fact that no fixed point can be determined which is sufficiently certain to prevent errors in measurement. In a rough way it is, of course, easy to determine by means of a plumb-line the median line of the trunk, and measure the deviation from that; but this method only gives the deviation and not the rotation. The hat-measuring appliance used by Zander and Beely is, of course, accurate as far as the measurement is concerned, but is complicated and expensive. But this, as well as any method, is faulty, unless means are taken to secure the patient's position. The method introduced by Schulthess of graphic tracing of different curves is ingenious, but it will be found to be complicated and not certain, as it is difficult to obtain perfect accuracy of position of the patient. This is also true of an ingenious apparatus devised by Mr. Barwell, of London,

for recording tracings. The accompanying method of recording rotation is, it will be seen, comparatively simple. It is based upon the principles advised by Barwell of recording by means of a half-circle the angles of rotation. But, more important than this, it depends upon the necessity of keeping the patient in a recumbent position when record is made. It will be readily admitted that if the patient is prone and the muscles thoroughly relaxed, there is less liability of change of position, either lateral or forward, or rotation of the hips or shoulders, than if the patient is standing. When the patient is upright, either standing or sitting, it is almost impossible to obtain at two different sittings precisely the same vertical plane or position of the axes of the thorax and the pelvis. Errors in observation are unavoidable. If the patient is placed upon a hard, level surface like a board, and made to lie in such a position, the muscles become relaxed, and the patient is simply immobile, or can be made so, and can be placed in a position in which this immobile position can be maintained without much trouble. In order to secure accuracy, it is better that the board should be marked with a line running along the middle, and also cross lines measured off by inches from the median line; so that, as the patient lies upon his face, the position of the shoulders and of the hips can be maintained precisely at the proper distance from the median line; that is, the trunk should be straight. For this purpose it is advisable that the clothing be removed in great part, and that it be seen that the anterior superior spines of both sides are at an equal distance from the smooth plane of the board, and that the shoulders touch. The chin can either be placed on the median line, with the head thrown back, or the face can be turned to either side temporarily. But where accurate measurements are to be taken, the chin should be placed on the median line. The arms can be placed at the side, and the feet should be slightly separated, at an equal distance from the median line. While in this position a cord can be stretched from the seventh cervical to the cleft of the buttocks, and the distance from this line to the diverging vertebra noted by means of a measurement. If necessary, the whole line of the spinal process can be marked out and measured; but, as a rule, the noting of the most divergent point will be sufficient. The outline of the sides can be traced by means

of a pencil upon paper on which the patient lies. A record of rotation is made, as is seen from the accompanying illustration, by simply placing the steel points, which are attached to the rod—placing these points in contact with the back, one point being placed at the most prominent rib, and the other at the greatest

Fig. 1.

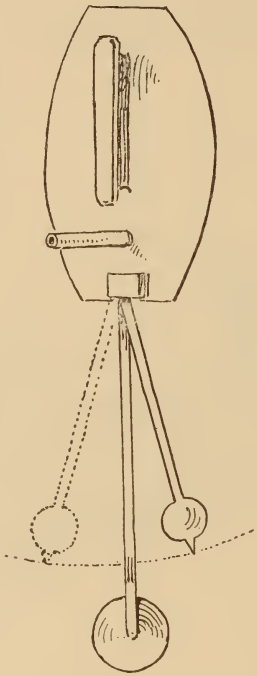


depression on either side of the spinous process, taking the level of certain of the spinous processes. It will be seen that this rod, which moves on a pivot, has attached to it a needle which points to a dial. As this rod rotates the degree of deviation from the median line will be seen. There is, of course, an error possible in this as in all methods. The limit of error, however, is found to be slight. The error is due to any resistance of muscle, and if the

muscle on one side is thicker than that on the other, and is firmly contracted, the record will be erroneous. If, however, the muscle is relaxed, as it is naturally in this position, and the rods are pressed firmly down, that error is eliminated.

A certain advantage will be found in tracing the curve of rotation over a record of angles; the latter is more readily done, but the former is less liable to error, as its accuracy is not dependent upon the position of two points, which may be erroneously taken.

Fig. 2.



The following means of recording the rotation of lateral curvature has the advantage of simplicity and accuracy. The patient is recumbent, and a thin light board is placed upon the back, being kept at right angles by resting against the frame seen in Fig. 1. On this board a slip of paper is pinned for the record. A small brass plate is arranged in such a way as to carry a pencil. (Fig. 2.) On this brass plate is a handle, and below is a projecting rod armed with a wheel. The wheel is placed upon the

patient's back, and the brass plate kept in contact with the paper. The pencil will make a tracing as the wheel is moved transversely across the patient's back. This record would be free from any error in twisting, but it would not be free from error due to any change in the inclination of the rod. In order to avoid this error a pendulum is hung, and any deviation in the proper axis of the instrument is readily noted and can be corrected. The transverse tracing should be taken at different portions of the back.

THE OPERATIVE TREATMENT OF SPASTIC PARALYSIS.

By CHARLES L. SCUDDER, M.D.,
BOSTON.

Little's disease, spastic paralysis, congenital muscular rigidity—these terms, from an etiological point of view, probably are synonymous. It is an affection of childhood, noticed at birth or soon after. It is characterized by a rigidity of certain groups of muscles, without wasting or loss of electrical reaction to faradism; by a peculiarly awkward gait, due to a loss of coördination in the muscles of the lower limbs; by an increase in the superficial and deep reflexes and by the presence of more or less mental impairment, which may be absent. Usually the adductors of the thighs, or the flexors of the arms or legs are involved, giving rise to a most distressing deformity.

Pathologically, as far as is at present known, the causative lesion is located in the motor tract of the central nervous system.

Spastic paralysis has been mistaken for certain conditions found in hip disease, infantile paralysis, and the paraplegia of Pott's disease. But if care be exercised the differentiation is easy.

Relief is sought for the progressive deformity which is the result of the rigidly contracted and shortened muscles.

Treatment by drugs and electricity has failed.

Surgically, an attempt has been made to improve the muscular conditions by attacking the cerebral lesion, but without success. Bullard and Bradford have reported such an attempt. As Bradford has suggested, when the surgery of the brain has become more advanced it may be possible, in a few of these cases, to attack the central nerve lesion successfully.

At times progression is absolutely impossible, and at best it is

much impeded. The deformity depends, of course, upon the groups of muscles concerned: if the adductors be involved, the child will stand with the thighs flexed and adducted. If the hamstrings be implicated, the feet are flexed, and in walking the child balances on the toes, dragging the feet close to the floor with a clinging gait, and rubbing the knees together.

To relieve the deformity, apparatus has been used, but no matter how well fitted and carefully managed, it accomplishes nothing permanent; the deformity recurs immediately upon its removal. Forcible correction, with or without ether, and immobilization in plaster are of no service.

Rupprecht,[1] apparently recognizing this deficiency in mechanical measures, calls attention to the good results obtained by tenotomy of the tendon of the gastrocnemius.

Bradford[2] has added still further to the advantages to be derived from this procedure, by demonstrating the utility of an open and thorough division of all resisting structures, whether presenting at the groin or ham. Uniform success has attended thorough tenotomy and myotomy of resisting tendons and muscles. In spastically contracted limbs, attended with immediate fixation. This success is at present an unexplained clinical fact. After tenotomy the muscles increase in size and strength.[3]

To the few reported cases of successful operation for spastic contraction of the lower limbs, let me add one more.

This case is made unique by the presence of a hydrocephalus, the existence of spina bifida, a rotary lateral spinal curvature, and because mental impairment is absent.

The patient is twelve years old, a bright and intelligent girl, with a good family history. At birth, in the middle of the back, a soft spot was noticed which gradually increased in size, becoming firmer, until at present in the lower lumbar region in the median line is a tumor the size of a flattened orange. The skin over this tumor is not thin, and fluctuation is distinct. There is no variation in the size of the tumor either upon pressure, manipulation, or forcible expiration. The base is broad.

[1] Volkmann's klin. Vorträge, 172.

[2] Trans. American Orthopedic Association, vol. iii. p. 7.

[3] Adams: Lancet, September 27, 1890.

In babyhood this tumor was aspirated, and after "weeping" a clear fluid for some time, the opening spontaneously closed. When two weeks old the child's head was noticed to be increasing rapidly in size. In the second year of life the anterior fontanelle was closed. At present the head is large. The circumference is twenty inches plus. There have been no convulsions at any time. The spine presents a marked dorso-lumbar lateral rotary curvature, which has developed gradually, and at present is rather poorly held by a steel waist-band, with crutches.

When two and a half years old the child walked. When eight years old the heel cords began to grow tight, causing a talipes equinus. A little later the knees began to strike in walking, and permanent adduction occurred; then the knees began to flex, and remained permanently so; the gait gradually changed, and now the child walks on the toes with the feet inverted, the knees forcibly adducted, the thighs flexed on the trunk, a moderate lordosis in the lumbar region, and in the dorsal region a marked rotary lateral curvature to the right.

Two years ago tenotomy was done on both ankles, with temporary benefit. At present the condition of the spastically contracted muscles is as follows:

The foot on the right side is flexed beyond a right angle, that on the left to exactly a right angle. Extension of the right ankle is possible to a little beyond ninety degrees. In the left ankle extension is practically normal. Abduction of the thigh is possible to a greater extent on the right than on the left. The right knee is flexed to about ten degrees, and the left to about twelve degrees. The muscular power of both thighs and legs is good. Ankle clonus is present, and the knee-jerk is exaggerated on the right side. The ankle clonus is absent from the left leg, and the knee-jerk is exaggerated very slightly. Both arms, and all other parts of the body, are in normal condition. The head has ceased to enlarge, so far as can be determined by external measurement.

The child, etherized, was placed prone. A V-shaped incision across one ham and an oblique incision across the other exposed the popliteal fascia, which, with the hamstring tendons, was divided; the semi-membranosus, biceps, and semi-tendinosus being severed both in the tendinous and in the muscular part. The tendo Achillis and

the plantar fascia were divided on the right side, and the tendon of the adductor longus on the left. Both lower extremities were brought into normal position, and immobilized in plaster-of-Paris from the tips of the toes to the groin. After a week the patient was allowed to be up and about with crutches, and retentive apparatus, consisting of an upright on either side of the leg, was fastened to the shoe below and the thigh-band above, a leather pad over the knee preventing flexion.

After about seven months she was allowed a portion of the time to go without the splints, and now, ten months after the operation, wears no apparatus. There has been no re-contraction. She is learning to use her legs well, stands straighter, and walks with slight assistance without the use of crutches.

The child is brighter than children of her own age, and is enjoying the greater freedom of movement which she now possesses.

These cases of spastic contraction, being at present incurable, are entitled to all the benefit that can be afforded by so safe an operation as above described. The spina bifida having remained for several years quiet has demanded no interference, and, considering the general good health of the child, operation of any sort is not justifiable. The spina bifida is protected by a hard rubber pad.

In the *Boston Medical and Surgical Journal* for January 17, 1889, p. 61, attention has been called to the necessity of dividing the tendons, where it is possible, near enough to the muscular belly to maintain a connection between the severed tendon and its muscle, thus preventing a matting together of the tendons in their sheaths, as happens when the division is lower. The same rule applies to the tendons of the ham. The division should be an open one, and through the tendons within the limit of insertion of muscular fibres.

SPASTIC PARAPLEGIA.

With Remarks on a Case Reported by Dr. Scudder.

By WILLIAM N. BULLARD, M.D.,
BOSTON.

Gentlemen: Dr. Scudder has requested me to say a few words in regard to some of the points of interest in this case, which I saw in consultation with him. Cases of spastic paraplegia in combination with spina bifida are very unusual. The origin of this form of paralysis in such a case is not at first sight plain, and it may be worth while to consider this subject shortly.

Before entering, however, into discussion of this special case, I should like to say a few words in regard to spastic paraplegia in general. By the term spastic paraplegia we designate a condition of the lower extremities in which their movements are more or less impeded by an increased tonicity or rigidity of the muscles, causing a greater or less fixation of the limbs, and a resistance thereof to both active and passive motion. This condition is in such cases always connected with some paresis of the extremities, and it may precede or follow such paresis, but in the large majority of cases the rigidity and paresis coexist. When the rigidity of the muscles continues unrelieved for a considerable time, permanent contractures are often formed, and these are well known to every surgeon. The contractures due to spastic paraplegia must be carefully distinguished from those due to other causes. They are totally different from the contractures found in old cases of anterior poliomyelitis, the so-called paralytic contractures, and are not to be confused with the conditions existing in congenital varus and club-foot, which are usually due to wholly different causes.

Spastic paraplegia, when permanent, is always due to an affection

of the lateral columns of the spinal cord. This affection may be primary or secondary.

Organic spastic paraplegiæ are of various forms. They may be of spinal or cerebral origin; they may be primary or secondary.

Spinal spastic paraplegia occurs in various affections of the spinal cord, but the contractures produced are rarely so great as to require or suggest operation.

In children—and it is of them only that I shall speak here—only one form of spinal spastic paraplegia is of ordinary occurrence. It is that form occurring in transverse myelitis, the "pressure" myelitis of caries of the spine. It may be caused by any form of pressure on the spinal cord.

The form of spastic paraplegia due to transverse myelitis is readily differentiated from that due to cerebral affections, both by the presence of affection of sensation in the former cases, and by the greater predominance of the paralysis over the spasticity.

Cerebral Spastic Paraplegia.

This form is very frequent, and nearly all spastic cases suitable for operation are of this class. This is both because the contractures in this form of paraplegia are more severe and more permanent and less amenable to treatment than those due to caries of the spine, and also because of the marked tendency to spontaneous cure in the latter cases.

(The term spastic paraplegia is sometimes used synonymously with cerebral spastic paraplegia. When used, as it sometimes is, improperly to designate a disease rather than a symptom, it assumes this signification. This involves, among other things, the error of assuming that all cases of cerebral spastic paraplegia are due to the same pathological condition.)

In children, in my opinion, practically all cases of spastic paraplegia not due to transverse myelitis (pressure paralysis) are of cerebral origin. (Primary lateral sclerosis is almost unknown in children, and hemorrhage into the spinal cord, producing this affection, seems to be very rare. The vast majority of cases of spastic paraplegia, not due to caries of the spine, present the characteristics of a cerebral and not of the spinal form.)

I shall not enter here into the causation of cerebral spastic para-

plegia in children. It may be due pathologically to any destruction or lasting inhibition of the functions of certain portions of the cortical area, or of the fibres which pass from them through the internal capsule and pyramidal tract into the lateral columns in any part of their course. It is commonly the result of intra-cranial hemorrhage, usually meningeal, or of atrophy of the brain from whatever cause.

To return to the special case under consideration. To what in this case is the spastic condition due? Is it an exception to the general rule, and may a spina bifida so act upon the lateral columns by pressure or otherwise as to produce a spastic paraplegia, or is it due to some other cause?

In regard to the possibility that a spina bifida should cause a permanent spastic contracture in the lower extremities, I should not wish to express an absolute opinion, but in any case it is very rare. It is true that paralyses of the lower extremities are not uncommon in spina bifida, occurring according to the statistics of the Committee of the Clinical Society of London in about one-fifth of the cases—53 out of 244—and this percentage is probably much too small. But these paralyses are not spastic in character, and do not lead to spastic contractures.

(Certain cases have been reported in newborn children where with spina bifida the lower extremities were held in a position of flexion, the thighs flexed on the abdomen, and the legs on the thighs; but in these there does not appear to have been any true spastic contracture.

Dollinger reports a case of temporary spastic contraction of the muscles of the lower extremities, which disappeared when the sac was emptied, and reappeared as it refilled. The sac was in the lumbar region.)

I have thus far been unable to find any account of spastic contractures occurring in uncomplicated spina bifida. In our case, moreover, several special reasons combine to render the hypothesis of its direct origin from the spina bifida improbable. In the first place, the paraplegia is of what we may call the pure type—*i. e.*, uncomplicated by symptoms referable to other portions of the cord than the lateral columns. This in children is practically always cerebral (primary lateral sclerosis in them being almost unknown); secondly, it is difficult to understand how a spina bifida in the

lumbar region could cause an affection of both lateral columns of the cord without more evidence of the affection of other portions.

But if the spina bifida is not the cause of these contractures, to what then are they due? In this and in all similar cases I believe these spastic paraplegiæ to be cerebral, and to be the result of the accompanying hydrocephalus. Spastic contractures in connection with secondary hydrocephalus are very common, but may, perhaps, more fairly be considered in many cases as the result of the primary lesion. In hydrocephalus, however, which appears idiopathic and primary, they are less common, but more frequent than is sometimes supposed.

Hydrocephalus connected only with spina bifida, as in our case, and not due to cerebral disease, must be considered primary. In connection with the late development of the contractures in our case that of Anton may be mentioned, where, in a case of congenital hydrocephalus, spastic contractions appeared in the previously unaffected extremities at the age of nine. This late appearance in primary hydrocephalus is probably not uncommon.

In this case, and in similar ones, therefore, I am inclined to believe that the spastic paraplegia is not directly due to any effect on the cord occasioned by the spina bifida, but is the indirect result of the accompanying hydrocephalus. The exact steps by which this result is produced are not yet wholly proved, but the numerous investigations now going on, on this and analogous subjects, render it not improbable that we may before long obtain a more exact knowledge of them.

DISCUSSION.

Dr. R. H. Sayre said that for many years, in watching his father's practice, he had noticed the very great benefit in these cases derived from free tenotomies of all contractured parts, but he thought that subsequently to the rectification of the position of the limbs, a great deal could be gained by the systematic use of massage. Faradization he had found fully as useful as galvanism, and the explanation was probably to be found in the exercise this current gives the muscles. In several cases where children were unable to more

than roll on the floor, after various tenotomies and the use of electricity and massage, the little patients were able to walk and even ride on horseback. Much of the growth of the leg is due to the fact that by the tenotomies opposing muscles are put in a position to exercise whatever remaining power they may possess. The relief of mental anxiety concerning their condition is probably responsible for the mental improvement frequently noted after such treatment.

Dr. Bullard, in closing, said that every case at the institution with which he is connected received thorough electrical treatment if such be indicated, and he also believed that faradization was more beneficial here than galvanism.

ADDITIONAL NOTES ON INJURIES TO THE SACRO-ILIAC JUNCTION.

By BENJAMIN LEE, M.D.,
PHILADELPHIA.

At the last meeting of the Association I had the honor of presenting the suggestion of the treatment of sacro-iliac disease and injuries to that region by means of strong continued compression of the pelvis laterally, or, in other words, *splinting the pelvis*. As one of the histories offered was incomplete as regarded the cause of the diseased condition, I requested permission to supplement it before the *Transactions* were published. No opportunity of seeing the patient, who had left for the West, occurred, however, until after the volume appeared. I therefore crave permission to supply the omission at the present time. My especial object in doing so is to emphasize the fact that an accident of a certain kind, when the subject is a stout woman, is almost sure to result in inflammation of the sacro-iliac synchondrosis; and, as will appear in another case which I shall relate, that the surgeon or physician who contents himself with a superficial examination of the points of apparent external injury, and does not make a careful scrutiny of the condition of these joints, and keep such cases under observation for months after, fails in his duty to his patient and himself.

The case of which I wish to complete the introductory history is that of Miss W. H., a music teacher, who, it will be remembered, was subjected to ovariotomy (oöphorectomy as the Grecists delight to call it) for the relief of persistent pain in the right iliac fossa, nervous irritability and sciatica, but without any decided amelioration of her sufferings.

I have since learned that the pain first came on a few weeks after having fallen on an icy pavement, coming down heavily, as she was

very fat, on the right hip. The other case which I reported has continued to improve until she now considers herself well, but as a matter of precaution I still insist on her wearing the instrument.

In the meantime I have been called upon to treat two more cases of the same injury, of which the following are the histories.

Mrs. E. H., aged fifty-three years, of irreproachable lineage and in the enjoyment of good health, married and the mother of several children, and weighing about a hundred and seventy pounds, on June 3, 1890, was run down by a horse while in the act of crossing the street. She fell heavily upon the rails of the street-car track, striking on the left hip and thigh. Seen shortly after the accident, she was suffering from nervous shock and local soreness, but was able to walk without assistance and without limping. Examined the next morning, the left leg was found to be discolored more or less from the hip to the ankle on its outer aspect. There was a large blood tumor, about four inches in diameter, beginning two inches below the trochanter. A curvilinear bruise on the right forearm, just below the elbow, showed where the horse's hoof had struck. The stiffness and soreness from these bruises wore off in the course of a fortnight, and for several months nothing further was thought of the accident. During the summer, however, walking produced an unusual and undue amount of fatigue. Toward the latter part of October she began to suffer from backache in the lumbar and sacral region. In the course of six weeks this pain became quite constant, being manifestly aggravated by fatigue and exertion, and began to creep down the left sciatic nerve. I was now consulted again and prescribed a tonic and massage. No improvement resulting from this course of treatment, I considered it expedient to make a careful examination of the origin of the sciatic nerve. This was done January 4, 1891, just seven months subsequent to the receipt of the injury, which had quite passed out of my mind. To my surprise and confusion, I found the lateral deviation peculiar to sacro-iliac disease quite noticeably developed. The crest of the right hip was partially uncovered, that of the left correspondingly concealed, the cervical spine was somewhat to the left of the median line, and the left shoulder slightly higher than the right. Pressure along the sacro-iliac junctions produced pain on both sides, but more on the left. It will be observed that in this

instance the spinal deviation was toward instead of away from the side on which the sciatica existed, a variation for which I confess myself at a loss to account. I at once enjoined rest, and ordered two pelvic bands, one for the day with side crutches, and one for the night without. These have been worn constantly ever since. The result has been the almost complete disappearance of the sciatic pain, unless after some unusual exertion, and a marked abatement of the backache. The spinal deviation has diminished fully one-half. Locomotion has become firmer, quicker and less fatiguing. Removal of support, even for a brief time, however, induces a return of the pain, which indicates that the injury is not yet repaired.

The second of the two cases has the following history:

Mrs. J. M., thirty-four years of age, weighs about a hundred and forty pounds; has had two children, the younger nine years old; her father died of smallpox, mother living and in good health; family history good on both sides; no consumption or scrofula. On the first day of July, 1891, she slipped on the brick pavement in her yard and fell, striking the occiput and the left buttock. She was at the time in the enjoyment of her usual good health. Her husband ran to her, having seen the accident from the window, and helped her up, but she was able to walk into the house, though feeling somewhat stunned and bruised. The next morning she awoke in great agony, the pain being referred principally to the lower part of the spine. She found herself unable to remain in any ordinary position, as lying, standing, or sitting; and walking caused severe pain. Stooping forward was impossible. The only position which afforded relief was sitting on the right nates with the body inclined to the right. She was conscious of being quite feverish, and felt generally sick. A well-known surgeon was at once called in. He prescribed the sitz bath and a lotion (probably muriate of ammonia) and a quieting draught.

I first saw her July 15th, just two weeks after the fall. She was still confined to bed most of the time; was able to turn in bed, and walked with difficulty; awoke every morning in great suffering; sleep restless and broken. Had some fever and profuse sweats, although the weather, as will be remembered, was by no means oppressively hot. Her appetite was very poor. On examination, a patch of discoloration about four inches in diameter was

found upon the left buttock. The entire cocyx was sensitive to pressure. The line of the sacro-iliac junction low down on both sides, but especially on the left, extremely so. There was a long deep ulcer following the cleft of the nates, which had been produced by the application of tincture of arnica by the advice of a friend. I at once ordered an English abdominal supporter, to be slightly altered in order to make a pelvic compressor while a more efficient instrument was being prepared. She experienced a sense of relief the moment compression was made, although it was done imperfectly. In a few days she was able to walk down stairs and superintend the work of the house. The febrile condition rapidly disappeared and the unnatural perspiration ceased. As soon as the ulceration, to which I referred above, had healed I prescribed an ointment of veratria and aconitia, which she fancied gave her some relief. She is provided with two belts, one for day and one for night, that for the day being much the more rigid. As no lateral deviation had yet manifested itself I did not consider it necessary in this instance to use either spinal supports or lateral crutches.

At the present date, August 6th, she is able to sit, walk, stoop, assume any ordinary posture with little or no pain. She is ordered, however, not to stoop, and to exercise great moderation in walking. Especially she is forbidden to put on her own shoes. Her ordinary appetite has returned. She sleeps all night and awakes refreshed and free from pain. The belts will be worn constantly for six months; and will then be cautiously removed experimentally.

In the Satellite of the *Annual of the Universal Medical Sciences*, for the month of August, 1891, occurs the following note under the heading

"Spasmodic Sciatica.

"M. H. Lamy (*Le Progrès Médical*, 1891, No. 2, p. 28) reports two cases of spasmodic sciatica. Charcot, Babrinsky, and Ballet have taught us that deviation of the spine is a frequent result of sciatica. They tell us that these deviations always consist in scoliosis, with an inclination of the vertebral column on the side opposite to that affected with sciatica. However, Brissaud (*Archives de Neurologie*, January, 1890), has demonstrated that the scoliosis may be homologous—that is, with an inclination toward the pelvis on the

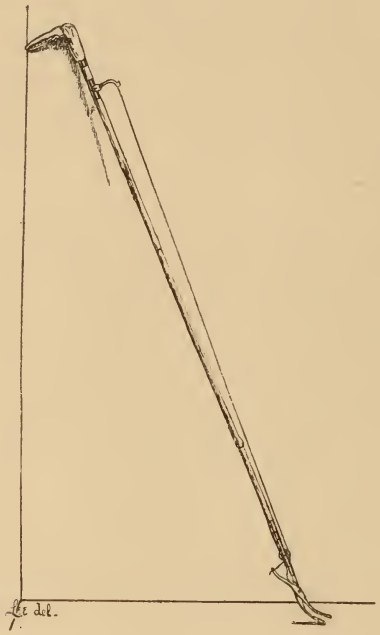
same side as the sciatica, and that this is observed in those cases where the sciatica is of a spasmodic nature.

"The two cases recently published by M. Lamy are examples of homologous scoliosis following spasmodic sciatica. In both cases the patients had an apparent shortening in the affected limb, amounting in one case to six centimetres (two and a half inches), and an apparent enlargement of the buttock on the same side. The apparent shortening of the lower limb was attributed by M. Lamy to spasmodic retraction of the muscles supplied by the lumbar and sacral plexuses—and retraction caused by pain. The enlargement of the buttock, the author thinks, may be explained by the rotation of the pelvis produced by muscular spasm; the rotation having for an effect the carrying backward of the trochanteric region of the affected side."

The quotation above given affords as curious an instance of the mistake of putting the cart before the horse as it has been my fortune to meet with in medical literature. The cases above described, and the affection to which they are attributed, answer exactly to the description of inflammation of the sacro-iliac synchrondosis as it will be found in the paper which I presented to the Association a year ago. The sciatica is not a cause but an effect. The sequence of occurrences is as follows: 1. An injury to the sacro-iliac synchondrosis, the result of direct lateral shock transmitted through the ilium, usually received primarily by the great trochanter. 2. As the result of that injury, subacute inflammation of the joint referred to. 3. As suggested by M. Lamy, very rationally, "spasmodic retraction of the muscles supplied by the lumbar and sacral plexuses," not, however, as he supposes, necessarily "caused by pain," but following the irritation of the nerves of the joint transmitted to the nearest nervous plexus, as we invariably observe it in every case of joint inflammation where the cartilage is involved. 4. As a result of the irritation of these articular nerves, and secondarily of the contiguous plexus and of the undue pressure resulting from the spasmodic muscular contraction and the consequent distortion, pain in the course of the sciatic nerve. It will be remembered that this irregular contraction of the muscles controlled by the lumbar and sacral plexuses was assigned by the writer at the last meeting as the initial cause of the large majority of idiopathic

lateral curvatures. We cannot be too cautious about accepting a neuralgia as the cause of any affection. It is in nine cases out of ten an effect.

In the course of this and the former paper on this subject I have insisted on the importance of prohibiting the patient from stooping. In order to diminish somewhat the hardship of this prohibition I have devised the appliance which I now show you, intended to



enable the patient to pick up objects from the floor while maintaining the erect posture. It consists, as you observe, of a spring forceps at the end of a cane, operated by a cord carried up to the handle and provided with a ring for the forefinger. The lower end of the forceps is slightly bent in order to accommodate it to the horizontal plane of the floor, and the jaws are somewhat serrated. By meams of this device, which I denominate the "Retriever," any article of moderate weight can be readily picked up, and even an object as small as a pin can be grasped.

The affections in which such an aid will prove serviceable are

numerous. They include spinal affections, paralyses, rheumatisms, and heart affections.

The aggravating sense of helplessness is thus greatly diminished, and many tedious moments of waiting for assistance are avoided.

DISCUSSION.

Dr. Cook, of Hartford, had had a little boy with severe sacro-iliac disease which had lasted for over two years. There was an abscess opening on the back, and one at the rectum. One operation had been done for the removal of dead bone. The general health continued to be pretty good, but he was at a loss what treatment would be most appropriate.

Dr. Lee, in closing the discussion, said that his studies of sacro-iliac disease had been particularly directed to recognizing the disease in its early stages, and preventing the development of so grave a condition. He thought, however, that support of the pelvis, even in such an extreme case, would give the patient the benefit of fresh air and locomotion, without any additional injury to the joint; but beyond this he had nothing to suggest.

OPERATIVE TREATMENT OF THE DEFORMITIES RESULTING FROM INFANTILE SPINAL AND CEREBRAL SPASTIC PARALYSES.

By DeFOREST WILLARD, M.D., Ph.D.,
PHILADELPHIA.

Infantile spinal paralysis and cerebral spastic palsy are diseases entirely different in their pathological conditions, their symptoms, causes, and prognosis. The one is due to an anterior polio-myelitis, with changes in the anterior column of the cord; the other is a destructive lesion of the cerebral motor cells; but the late results demanding operation, which will be considered in this article, possess certain similar deformities in common, so that the two conditions may be surgically considered somewhat together. Of course, in the one case we have atrophy, loss of reflexes, paralysis of certain groups of muscles, etc., while in the other we have rigidity, paralysis with muscular spasm, irregular and uncertain contractions, but little real and sometimes no apparent wasting of the limbs, and electrical reactions are not lost. Reflexes also are exaggerated in the cerebral or latter type.

The primary results obtained by operation are much greater in infantile paralysis, for the reason that the disease which has occasioned the deformity, although permanent in its effects, may be said to be definitive and without that tendency to relapse that is seen in cerebral palsy, yet even in the latter class of cases a certain degree of benefit is attainable.

In an article read before the Tenth International Congress at Berlin,[1] I showed the results that could be obtained from surgical

[1] "Transactions of the Tenth International Congress;" also, American Journal of the Medical Sciences, April, 1891.

procedures in a large majority of cases of infantile paralyses, even when they were helpless and apparently hopelessly deformed. The minor distortions were not considered, nor is it my purpose here to call attention to any but the almost desperate class of cripples in whom locomotion has become almost impossible, and who spend their lives upon the floor, or upon a bed; these are the individuals who are looked upon even by physicians as beyond surgical relief. I have operated upon a large number of these cases, and I am more and more convinced that the ones incapable of benefit are exceedingly few in number. While they cannot be made perfect and strong, yet the improvement in locomotion can be greatly increased after operation, by the aid of canes, crutches, wheeled apparatus, etc., and thus strength of limb will be secured, greatly to the benefit of the physical, mental, and moral condition of the patient. As only the tendons of the stronger muscles are divided, muscular equilibrium is assisted, not impaired. The muscles operated upon are improved, and when section is followed by walking, increase of power is soon apparent. Let anyone who thinks that locomotion does not improve limbs look at the legs of a ten-year-old boy with untreated club-foot, and at another similar case in which operation has been done early, thus securing locomotion during this period of years.

In spastic cases, of course, the permanent improvement to be expected is far less. The disease is more centrally located, and the mental power of these individuals is decidedly defective. The improvement will be in proportion to the brain-power already existing.

These children are brought to the orthopedic surgeon by their parents, expecting that his skill can supply what Nature has denied them. I have sometimes had as many as a dozen new cases brought to my office in a single week, many of them hopeless idiots, but whose deluded parents thought them bright, intelligent children. This delusion is so happy a one that it is often unkind to attempt to explain to parents the full degree of the idiocy. While an

[1] I have been much surprised at the number of these spastic children, as until recently my experience had been largely among infantile spinal cases. I note, however, that Townsend and Zachs have found that these spastic cases stand in the proportion of 39 spastic to 61 infantile. N. Y. Med. Journ., May 2, 1891; Trans. Med. Soc. State N. Y., 1890.

injured brain-cell can never be replaced by a good one, yet I am fully convinced that great physical, mental, and moral benefit is to be derived from placing these individuals in the upright position upon some form of locomotive apparatus. I am very careful, however, as regards the prognosis.

Mechanical measures are exceedingly important as preventives of deformity, but for purposes of rectification they cannot take the place of surgical procedures. I consider it barbarous to attempt to rectify the permanent contractures of infantile paralysis by the long and painful process of pressure, when during a few minutes under anæsthesia, surgery is capable of producing the results desired.

The resultant limb following surgical procedures is in no wise inferior in strength and development to the one produced by mechanical measures, and the serious loss of time and money and the pain incurred in the slow method certainly demand consideration. No physician has a right to take money from patients by a slow, expensive method when it is so entirely unnecessary.

When infantile cases are neglected and proper preventive apparatus has not been used, deformity follows from (1) degeneration of muscles; (2) atrophy; (3) contractures; (4) deficient and retarded bone growth; (5) distortion of skeleton produced by efforts at locomotion.

The deformities of contraction are usually in the direction of flexion. In general terms, surgical procedures should consist in the division of all the contracted tissues, whether tendons, muscles, or fasciæ. The great cause of failure is in the too limited division, not from extensive section. In the majority of cases the *tenotome* is sufficient for this work. Open incision is advisable when there is great risk of injury to the bloodvessels or nerves.

In hip contractures a tenotome with a long shank entered in front of the anterior superior spinous process is capable of safely severing the origin of the tensor vaginæ femoris, the sartorius, the long head of the rectus, and all the contracted fasciæ. Strong pressure will usually complete the extension of the limb with rupture of the remaining fascial adhesions, provided the patient is placed upon his face and the pelvis is properly fixed.

In cases where the psoas or iliacus has become shortened, sub-

cutaneous incision becomes too dangerous, and open incision should be performed.[1]

The rule should be in all operative procedures to bring the limb into such position that it will be mechanically able to support the weight of the body in locomotion. In hip contractures, where this cannot be entirely obtained at the time of the operation, it may be subsequently gained by the application of pulley-and-weight extension in the horizontal position. This extension should be continuous, and it will usually result in benefit not only to the hip, but to the accompanying lordosis. The scoliotic spinal distortions so often found in these cases are the most troublesome element in cure.

The following illustrative cases are selected as among those presenting marked difficulties:

Case I.—W. W., aged fourteen; infantile paralysis in childhood; has never walked since; legs absolutely helpless; flail legs from hip. No voluntary action in foot or toes. Excessive lordosis from tilting of the pelvis, which is raised on the right side three inches above the left. Excessive lateral curvature, with rotation of the vertebræ and prominence of the left thorax posteriorly. (Fig. 1.) Arms also extensively atrophied and very helpless. Simply able to lie upon the floor or on a bed. Flexion of thighs to a right angle; at knees nearly the same. Right foot, equino-varus; left, valgus. The whole body greatly emaciated and illy nourished from insufficient food. The boy was so feeble that, after tenotomy on one side had been performed, it was necessary to wait several weeks before the other side could be given attention.

Tenotomy of the tensor vaginæ femoris, the sartorius and long head of the rectus, the hamstring tendons and the tendo Achillis on both sides was performed. The knees and feet were brought straight, but the thighs could not be put in normal position; nor could the pelvis be brought into its proper relation to the spinal column, as the latter was so greatly distorted. Long-continued extension and counter-extension, however, added to the benefit obtained at the time of operation, but even after an apparatus with

[1] Had I done myotomy subcutaneously in a recent case, I would most certainly have divided the anterior crural, which lay external to its normal position.

rigid joints was applied from the thorax to the feet (Fig. 2) the arms were incapable of supporting him upon crutches. A wheel-crutch was therefore constructed in order to support the weight of the body until locomotion could assist in giving some power to the legs. (Fig. 3.) With this he was able to progress very satisfactorily with the aid also of his apparatus, but without both crutch and apparatus he was helpless. A year later, however, had increased so much that he could extend the leg upon the thigh when sitting, although on admission he could not even move his toes.

Case II.—J. C., aged seventeen; infantile paralysis. Unable to walk since infancy, except with apparatus and crutches; thighs and hips flexed permanently; has not walked in any way for two years. Right foot, equino-valgus; left, equinus. Pelvis greatly tilted; extreme lordosis. Excessive lateral curvature of the spine, with marked rotation and prominence posteriorly of the left thorax; arms strong. (Figs. 4 and 5.)

Tenotomy of the tensor vaginæ femoris, the semi-membranosus, and the semi-tendinosus on both sides; also of the tendo Achillis on both sides and of the peroneals on the right. Forcible extension; retention in plaster-of-Paris. Apparatus applied in six weeks. Legs still very helpless: must walk on crutches for some time. Great difficulty in applying the apparatus on account of the lateral and backward tilting of the pelvis, which can never be cured, although extension and counter-extension while in bed has helped the condition greatly. Is now walking on crutches and apparatus, and the legs are developing.

Flexion at the knee may be relieved by tenotomy of the semi-membranosus, semi-tendinosus, and biceps. In old cases the contraction of the fascia is often very great, and when it extends to the mid-popliteal region, open incision should be performed. In a recent case, even after open incision, it was impossible to elongate the popliteal nerve, which was so displaced from thickening in its sheath that it would have been mistaken in a subcutaneous incision for a tendon.

The use of extreme force in straightening the knee after deformity should be avoided, as it is liable to produce posterior displacement

of the head of the tibia. Unfortunately, this displacement is frequently acquired from long continuance of the deformity, and more radical measures for its relief (as described later) may be necessary.

Deformities at the ankle and foot are very common in infantile paralysis which has a special tendency to implicate the muscles of the lower leg. The deviation is in the direction either of flexion, extension, inversion, or eversion.

In talipes equino-varus, which is the most common form of deformity, the section of the tendo Achillis alone is seldom sufficient. The foot should be brought into the best mechanical position. This means that the foot should be brought squarely upon its sole in walking, and that extension beyond the right angle shall be easily performed without undue tension upon the tendon. Section of the tibialis anticus, posticus, and plantar fascia, and in fact of all contracted tissues, should be thoroughly employed. It is better to bring the foot straight at the time of operation than to half-do the the work and then torture the patient by subsequent attempts at mechanical rectification. The cutting of the internal plantar artery is of no consequence, since it is small. Every resisting structure should be divided, even the lateral and plantar ligaments if necessary. Powerful force applied over a hard sand-bag as a firm fulcrum is often necessary to secure complete rectification. Subcutaneous work heals more quickly and leaves less deformity than open incision on the inner side of the foot, but the division of all the tissues is nearly the same in either case.

In valgus cases the mistake is often made of supposing that the peroneals alone are contracted. This is owing to the fact that the anterior part of the foot can easily be brought into such position that flexion is apparently decidedly beyond the right angle. This error arises from the fact that undue motion is obtained at the medio-tarsal joint, which, with the sinking of the scaphoid bone, gives the appearance of full normal flexion. A skilled examination of these cases will show that the articular facet of the calcaneum does not by any means assume its normal relation with the tibia and fibula. That which was apparently full flexion of the foot is in reality not so at all, since the tendo Achillis is entirely too short to permit of the proper relation. The inferior calcaneo-scaphoid

ligament is elongated, the result being a distortion of this articulation, a painful condition of flat-foot, and a tender scaphoid, which renders locomotion extremely difficult and painful. (Fig. 6.) This malposition of the os calcis from the contracture of the calf muscles is very common, and is often overlooked. In a case recently under my care this was markedly illustrated. The anterior part of the foot could be brought apparently far beyond the normal angle of flexion, and yet the os calcis remained decidedly in the position of extension and required fully an inch of material in the Achillis to permit a proper position to be attained. When the tendo Achillis is thus contracted, the strain brought upon the calcaneo-scaphoid articulation in walking is very great, and its results harmful, as above stated; for easy walking, flexion of the foot should be possible for from fifteen to twenty degrees beyond the right angle.

Section of the tendo Achillis, as well as of the peroneals, is, therefore, an important matter in the treatment of these cases; nor should the forcible reduction and subsequent retention of the misplaced scaphoid by gypsum be omitted. Continued retention of this misplaced bone should be secured by the use of a support placed beneath the plantar arch, which will assist in holding the bone in position, while at the same time the position of the bones of the foot should be altered by raising the inner side of the sole of the shoe so that the individual walks as upon the side of a hill. (Fig. 7.) Care should be taken in the primary dressing to bring the calcaneum into its proper position.

For the primary dressings, after any or all sections, I prefer plaster-of-Paris; it sets rapidly, secures absolute rest, and favors healing. If swelling occurs, the cast may be slightly opened, or windowed, or removed, as necessary.

In talipes calcaneus an open incision over the tendo Achillis, the removal of a section, and the suturing of the two cut ends with sterilized catgut will be helpful.

Under antiseptic conditions the subcutaneous operation for ordinary sections is a safe one. I have performed it hundreds of times, and never had a case of suppuration. If a surgeon operates upon a dirty foot with septic instruments he must expect poor results. Very few attendants will properly cleanse the epithelium from a deformed foot.

Open incision, splitting, and suturing the tendon has been recommended on the ground that by the subcutaneous method we do not secure the exact amount of material required. I certainly have never experienced this difficulty, and see no occasion for its employment except in calcaneus. If the foot is fixed in the proper normal position, Nature will supply the exact amount of material required, and the resultant tendon will be just the one necessitated by the case. I have had two and three inches inserted in a tendon and never had a weak result. I should expect to have such an accident if I followed the ancient plan of dressing the foot after the operation in the deformed position, and then attempted later to rectify the deformity. Nature is perfectly capable of throwing out the one hundred parts of new material required to bridge the gap, and will undoubtedly do so when called upon to perform the work. When dressed in the deformed position, possibly only fifty parts are deposited. This scanty band, when elongated, is necessarily incapable of filling the gap. The requisite hundred parts could just as easily have been secured.

The question of age is of no special importance except as regards bone distortion. Prompt healing of the tendons may be expected if careful antisepsis has been employed and subsequent rest enforced.

Resection of the knee is sometimes necessary when the displacement of bone is very great, and when the distortion of the head of the condyle or head of the tibia is very marked. It is also sometimes desirable in a flail limb when apparatus cannot be afforded, and when a stiff knee will be of more service; also, when there is a bad condition of genu-varum, valgum, or recurvatum.

Resection of the astragalus or of other tibial bones is occasionally necessary in old cases; but, as a rule, thorough division of the contracted tissue and extreme force will rectify this condition.

It is but occasionally that amputation or osteotomy will be necessary, although they are sometimes justifiable.

Mechanical Appliances.

Rest should be maintained until all danger from inflammation is past. After two weeks crutches may be used and mechanical appli-

ances employed. No rules can be given for the making of the apparatus; it must be so adjusted that it will keep the limb in the best position for walking, and as accurately as possible in the normal position. Feeble muscles must be assisted by elastic or spring force, and a stop-joint or a locked joint employed as necessary. Every muscle should be compelled to do its fullest possible work as early as possible. In many cases with which we have to deal it is impossible to expect voluntary locomotion at first. Patients must be assisted by wheeled crutches, or by crutches or canes in addition to apparatus. These appliances are as necessary to these cases as is an artificial limb to a man whose leg has been amputated. Electricity, massage, gymnastics, etc., should never be omitted.

Case III.—L. C., aged fourteen; infantile paralysis in infancy; never walked since, except with apparatus with rigid joints. Flexion at both knees; hips and ankles in good position; lateral curvature of the spine, with left dorsal rotation.

Section of the hamstring tendon; apparatus constructed; leather jacket; movable joints in apparatus, with elastic straps to assist all weakened muscles. With this assistance she was able to walk a mile after three months. (Fig. 8.) She was kept in plaster-of-Paris dressing for four weeks.

Case IV.—J. M., aged eleven; absolutely helpless from infancy; has never walked; great flexion of hips and knees; feet but slightly distorted, as they have never been used. Tenotomies as before. Plaster-of-Paris dressing; apparatus. Walked with crutches at the end of six weeks, with cane at the end of seven months; still improving. (Figs. 9 and 10.)

Case V.—A. M., aged ten; has never walked since an attack of infantile paralysis at one year of age. Hips and knees contracted: talipes equino-varus of left foot; equino-valgus of right foot. (Fig. 11.)

Tenotomy of tensor vaginæ femoris and of hamstring muscles. Section of tendo Achillis and of the contracted fascia on the left side and of the same tendons and peroneals on the right. Plaster-of-Paris dressings; apparatus in five weeks. At the end of five

months walking with crutches and supporting apparatus, and without fatigue for several blocks. These cases could be increased by dozens, but the above are sufficient as examples of the assistance that can be rendered. (Fig. 12.)

Case VI.—R. C., infantile paralysis; can only walk on all-fours; hips, knees, and ankles distorted. Tenotomies. Walks with crutches and apparatus; improving daily. (Fig. 13.)

Cerebral Spastic Cases.

I am confident that the benefits to be derived from locomotion in spastic cases is not to be gained in any other way. The effect upon the physical well-being is marked; mental development occurs and is assisted by bringing the individual into contact with the world, an effect which should not be underrated. Some may say that brain-cells cannot be replaced. This is certainly true; but, as in the case of enfeebled muscles, constant exercise tends to produce growth and development. This action may be described as a benefit to be derived from without inward, but it is nevertheless positive. That it can produce a fully developed mind no one claims, nor can fully developed muscles be secured; but at the same time the gain derived is positive and decided.

The most common deformity in spastic cases is flexion of hip and knee, with contraction of the gastrocnemius and soleus. Adduction of thigh is also frequent. All the deformities increase greatly as soon as the patient stands upon his feet.

Simple tenotomy of all the contracted flexor tendons is usually required. Myotomy of the adductors is also quite frequently necessary. The necessary operations have been already described under infantile paralysis.

In dressing these cases I usually over-correct the equinus, then apply the gypsum bandages to retain it in this position. The knee is then rigidly fixed in a straight line, and a continuous plaster dressing from feet to thighs applied. This permits complete and perfect abduction to be secured by simply separating the feet.

The weight of the plaster cast is ordinarily sufficient to lessen the hip flexion after myotomy of the tensor vaginæ femoris and fascia,

but weights are sometimes necessary. The hip flexion is the one most liable to relapse when the upright position is resumed; hence I often use the wheel-crutch for a time so as to take off the weight of the body.

Selected Illustrative Cases.

Case I.—G. B., aged nine. Very low degree of mental development; unable to talk, but can articulate a few words; unable to stand except with support. Hips, arms, and legs in a constant state of spasm when voluntary motion is attempted.

Tenotomy of the hamstring tendons; also, tendo Achillis, both sides. Extension in bed; gypsum dressings; limbs abducted. Wheel-crutch constructed so as to be pushed by a nurse like a baby-carriage. (Fig. 14.) In this manner he is able to progress with much less spasm, and can bear considerable weight on his legs. No marked improvement in mental condition anticipated.

Case II.—G. W., idiot of low grade. Hip, knees, and feet so greatly flexed with adduction that walking would be impossible even if brain were sound.

Section of tensor vaginæ femoris, adductors, hamstrings, and tendo Achillis, both sides. Subsequent extension in bed and retention by gypsum.

Apparatus in six weeks, and with wheeled crutch can make decided progress. Limbs in excellent mechanical position for walking; improvement only to be expected after long use.

Case III.—Cerebral spastic paralysis from birth; walks on tips of toes; toes inverted in position of talipes equino-varus. Knees, thighs, and adductors flexed; moderate degree of mental impairment; marked internal strabismus; cannot walk without support, and then with the usual staggering gait.

Section of the tendo Achillis and of the adductors. Knees forcibly straightened and retained by plaster-of-Paris dressing from toes to perineum; limbs widely parted and fastened. Apparatus applied; in six weeks heels well down upon the floor, although still pigeon-toed; six months later walking with comfort.

Case IV.—L. L., five years of age; suffered injury by forceps at birth. No decided depression discovered in skull; very feeble intellect; can only stand when supported; talipes equinus in both feet.

Section of the tendo Achillis; put upon a wheel-crutch at the end of six weeks, and with the aid of a nurse could walk with much comfort and pleasure.

Apparatus for these cases is often very complicated and expensive, and is even then insufficient. I have long tried to secure a wheeled support for these unfortunates, but all those in the market are so expensive as to place them far beyond the reach of a large number of sufferers. With the valuable and helpful assistance of Dr. George E. Shoemaker, I have now constructed such a support that is both practical and cheap. To save expense material is used that is already in the market. The running-gear of baby-coaches or of children's express wagons or buckboards are utilized. These can be procured at from four to six dollars a set. For young children, or for those who are so feeble-minded or feeble-muscled as to require an attendant, a baby-coach running-gear frame can be utilized, which can be guided or pushed. Upon this frame is erected a crutch-support, such as is seen in the photograph. (Fig. 14.) The crutch-head can be raised or lowered by a nut and thread. Jar is prevented by rubber washers. The width of the crutch-heads will vary with the diameter of the thorax. For very helpless cases a broad supporting belt of leather encircles the chest. (Fig. 14.) For children who are strong and able to control themselves the hinder wheels are similar to the former ones, but the front ones are pivoted as in rolling-chairs, ward carriages, etc., thus permitting movement in any direction.[1]

[1] *Details of Construction of Pushing Wheeled Crutch.*

The "running-gear," including wheels and wagon-frame with curved handle-bars, may be obtained ready-made from large dealers in baby-coaches by ordering the "S spring" pattern with shaved spokes and without brakes. The iron-work, which any blacksmith can make, consists of two essential parts on each side steadied by cross-braces. A main frame shaped like an inverted V is bolted front and back to the carriage platform; this may be from four to six inches lower than the total height of the crutch. Into the upper angle of this frame is welded a horizontal piece of strap-iron, one-eighth of an inch thick, five-eighths of an inch in width, and four to four

In hospitals with long halls a longer apparatus with self-steering gear may be employed, and is very useful in educating patients to walk. When a paralytic, say fourteen years old, has never been upon his feet, it is not to be expected that he will even know how to

and a half inches long. This plate is pierced by two holes, through which freely slide the perpendicular crutch-supporting rods.

The crutch-support is the other essential part. It consists of two parallel rods, joined at the top by a flat piece of strap-iron, three inches long, welded in and pierced for bolting to crutch-head. These rods, three inches apart, pass from the crutch-head down through the plate at top of main frame, and through holes in the wooden side-bar of the running-gear. A thread is cut for a distance of six or eight inches from the lower end for height adjustment. Two nuts with washers play on this thread, one above and one below the wooden side-bar.

Springs are provided by rubber perforated discs or washers, known to the rubber trade as "gauge-glass washers." Of these, four are placed in a series on each rod below the upper nut and above the side-bar. The patient's weight falls then upon these discs or rubber springs.

The crutch-heads are bolted on; the nut being countersunk in the wood above, while the bolt, having a slotted head like an ordinary screw, is driven up from below. The same bolts serve to fasten on an iron loop for the attachment of a belt which goes around the patient's chest. This "loop," so called in the carriage-maker's trade, is ordinarily used to attach the breeching of harness to the shafts.

It remains to describe the cross-braces, which serve also to adjust the distance between the crutch-heads to varying widths of chest. These braces pass from a rivet through the plate at top of main frame, across the foot of opposite frame behind. The brace is here bent downward so as to pass through the bolt-hole in the foot of the iron frame and through the wooden side-bar. A thread is cut for four inches from the end, and two nuts, one above and one below the side-bar, furnish the adjustment required, as well as serve to hold the parts together at this point. (This feature is shown in the photograph of the swivel wheel-crutch, but not in that of the baby-coach running-gear.)

The material used throughout is one-quarter inch round iron, which is quite strong enough for light-weight children, whose axillæ are not more than forty inches from the ground. The strength of the ordinary baby-coach gear renders this form of apparatus unsuitable for patients of larger growth.

Details of Swivel Wheeled Crutch.

The iron-work is the same as that described for the pushing-crutch, except that it may be heavier. Three-eighths of an inch round iron for the main frame, with five-sixteenths of an inch iron for the braces and crutch-supports, is quite heavy enough for cases weighing about one hundred pounds.

The wooden frame or platform may be made of ash, two inches by one and one-half inches. The length may be thirty inches, and the width eighteen inches over all. An iron brace, eleven inches long, runs from the rear axle diagonally across the corner.

The hind wheels, with their axle and bolster, may be bought of dealers in toy wagons—for instance, those used to form a part of a boy's "buckboard," the platform

use his feeble muscles for a long time. In spastic cases many patients who cannot walk at all without this apparatus can by its aid make very comfortable progress.

Conclusions.

1. The deformities following infantile paralysis can be largely prevented by apparatus; but if this has been neglected, and distortion has occurred, the best possible limb is to be secured by immediate surgical procedures, and by making the patient walk, even though imperfectly.

2. Many apparently hopelessly distorted cases can be put upon their feet. Even great deformity of limbs resulting from infantile spinal paralysis should not deter us from the attempt to straighten the limb and give the individual locomotion.

3. Contracted limbs can be straightened, and can then be incorporated as a part of a locomotive apparatus.

4. Exercise is capable of developing even badly shrunken limbs, and continuous improvement may be expected.

5. Easier, quicker, and better rectification is secured by surgical measures than by mechanical ones in the majority of cases. Immediate rectification, if possible, should be the rule in order to save pain and time.

6. Tenotomy and myotomy do not cure the disease in either form of paralysis, but the results are most helpful in promoting the health and happiness of the individual.

7. Mechanical appliances in the shape of apparatus, canes,

of which stands seventeen inches high, and retails for six dollars. The front swivel wheels may be obtained from manufacturers of certain rolling-chairs. They bolt to the under surface of the platform.

The dimensions for a typical apparatus for a patient measuring forty-five inches from axillæ to heels, and eight and one-half inches across the back, are as follows: Height of platform, seventeen inches; perpendicular height of main fixed frame, twenty-two inches; length of sliding crutch-support, thirty-one and one-half inches, allowing three inches extra for adjustment. Five inches of thread should be cut on the end of each brace.

The belt may be of light sole-leather, five or six inches wide, and fastened by straps and buckles.

A patient's chest-breadth may readily be measured by putting a book in each axilla close to the chest-wall, and measuring the distance between the books.

crutches, wheeled crutches, etc., are usually required, and should be employed after straightening.

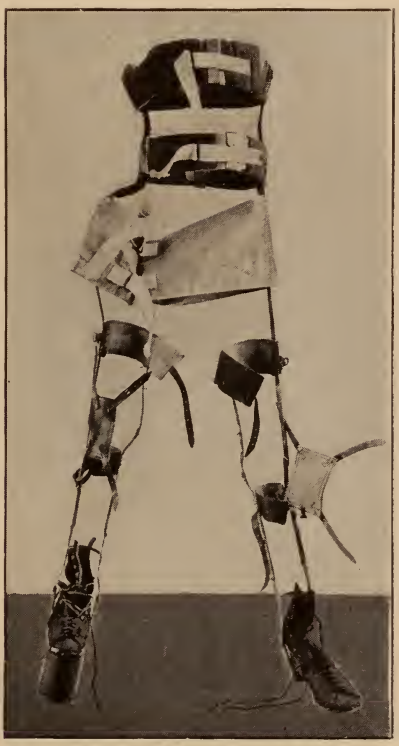
8. Wheeled crutches are very helpful in getting these helpless individuals upon their feet. These supports can be made of inexpensive material and on a simple plan.

9. In spastic cases relapse is much more common than in infantile paralysis, but the great benefit secured by locomotion to the body and mind of the individual amply repays for the attempt at rectification.

Fig. 1.

Excessive lateral curvature with rotation—legs absolutely useless from infantile paralysis.

Fig. 2.



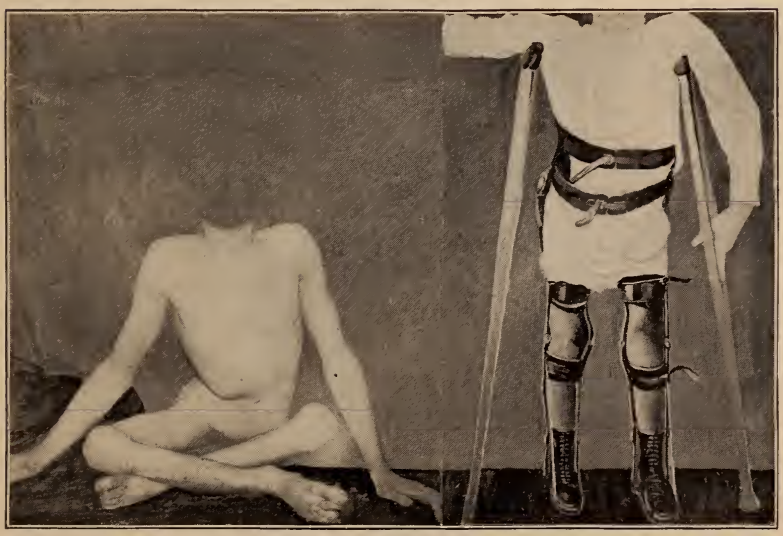
Rigid apparatus to give artificial legs.

Fig. 3.

Wheeled crutch to assist locomotion.

Fig. 4.

Fig. 5.



Infantile paralysis, lower extremities.

Apparatus and crutches for use after tenotomy.

FIG. 6. FIG. 7.

Talipes valgus of left foot, varus of right.

Tenotomy followed by use of apparatus.

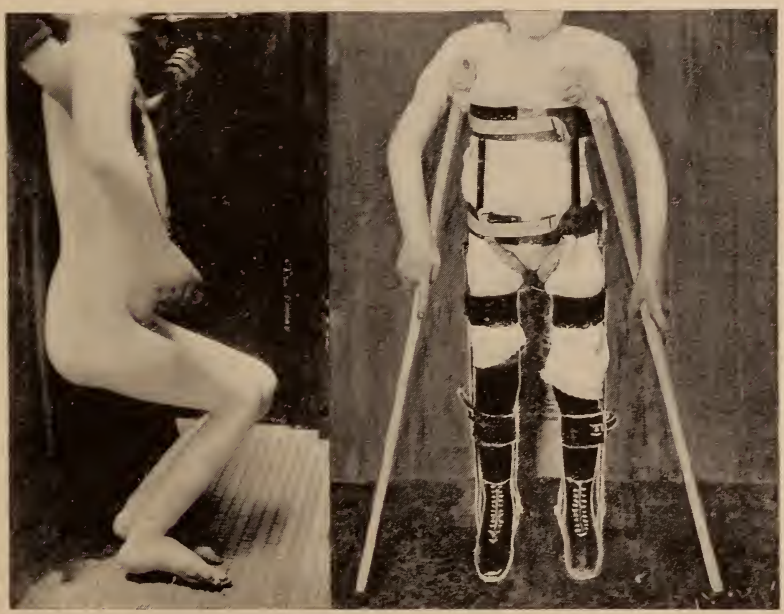
FIG. 8.

Apparatus for paralysis and jacket to support body.

Fig. 9. Fig. 10.

Legs useless from infantile palsy. Apparatus applied after operation.

Fig. 11. Fig. 12.



Legs helpless for nine years. Locomotion on crutches, and apparatus.

Fig. 13.

Locomotion only on all fours for years.

Fig. 14.

Pushing wheeled crutch.

EXHIBITION OF APPARATUS.

Dr. Cook, of Hartford, described a simple method of taking plaster casts which would enable one readily to mould a spring-sole to fit any given case.

He also exhibited a method of easily attaching a rubber muscle to the foot when this was necessary.

A third device of the same gentleman consisted in a flat projecting piece of metal attached to the heel of the shoe, to compel cases of a paralytic deformity to walk squarely on the ground.

Dr. T. Halsted Myers, of New York, devised a stretching shoe for the treatment of talipes equino-varus, which was reversible, so that it could readily be applied to either foot.

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